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The Mechanical Division Convention

THE ANNUAL CONVENTION of the Mechanical Division of the American Railway Association, which is to be held in Chicago next week, will be for several reasons an unusually important gathering. The mechanical departments of the railways have had for some time, and will have for years to come, problems of great difficulty and importance to solve. Several special articles giving information bearing upon some of these problems are published in this issue of the *Railway Age*. In our issue for next week we shall give a very full report of the proceedings of the convention. We hope and believe that the features of our issues for this week and next week dealing with mechanical problems and reporting the annual mechanical convention will be found by our readers of more than ordinary interest.

It is now almost a year since the nationwide strike of the shop employees began. If anybody had predicted at that time that the railways, in spite of the strike, would do as well as they have during the last year he would have been regarded as a hopeless optimist. The object of the strike was to break the railways down and force them to pay the wages demanded by the strikers. The strike in the coal mines was in effect when the shop employees' strike began and lasted until September. During the nine months since then the railroads have moved more carloads of freight than ever before in any corresponding period of their history. The increase in carloadings since January 1 over those of any previous year has been especially notable. The previous record year was 1920. The total cars loaded with freight from January 1 to May 26, 1920, was 16,817,767, while in the same period in 1923 the loadings agregated 19,035,772 cars, an increase of 13.2 per cent. The increase over 1920 in the loadings of grain and grain products was 23 per cent; livestock, 46½ per cent; coal, almost 4 per cent; coke, almost 42 per cent; forest products, over 17 per cent; merchandise and miscellaneous, 14½ per cent. The only decline in loadings was in those of ore, and was only 3½ per cent.

It is quite obvious that this remarkable record could not have been made if the mechanical departments of the railways had not furnished the transportation departments equipment in condition to move the business. The fact that the mechanical departments were dealing not only with their ordinary current problems, but also with those resulting from the strike, makes the results secured all the more remarkable and reflects the greatest credit upon the mechanical departments.

It is interesting at this time, when almost a year has elapsed since the strike began, and when the Mechanical Division is soon to hold its annual convention, to review the changes in the condition of equipment, which have occurred within the last year and note its condition at present. On July 1 the number of freight cars reported in bad order was 324,583, or 14.3 per cent of the total number in service. On August 1 this had increased to 345,013, or 15.3 per cent. Since then the number of cars in bad order has steadily declined. On May 15 it was only 210,243, or 9.3 per cent of the total number in service. This was 114,340 less than on July 1 and 134,770 less than on August 1.

The number of locomotives in bad order (those needing repairs requiring over 24 hours' work) on July 1, 1922, was 11,318, or 17.6 per cent of the total number. This increased until on September 15 it was 16,572, or almost 26 per cent of the total number. Since then it has been steadily declining and on May 15 it was 12,183, or 19 per cent of the total number. This was 865 more than on July 1, but 4,389 less than on September 15. For reasons familiar to railway men it has been much more difficult to overcome the effects of the strike on locomotives than on cars. In view, however, of the fact that owing to the heavy business moving the equipment has been subjected to especially hard use, the progress which has been made in maintaining and even improving its condition has been most gratifying.

It would be impossible to exaggerate the arduousness of the work which mechanical department officers of all ranks have had to do during the last year to render it possible for the railways to make the splendid record they have made in handling a record breaking business. After having gone through a year of almost unprecedented toil and hardships the mechanical officers are obliged to face the fact that they cannot for a long time to come remit their labors. There is no prospect of an early decline of freight business and therefore no prospect of a decline in the demands upon equipment. There is still an excessive number of cars and locomotives which are in bad order and must be put in good order. Many new locomotives and cars are being received. Shops and terminal facilities are inadequate to maintain them properly and secure the fullest possible utilization of them and the situation demands the closest co-operation between the mechanical and transportation departments, as well as the enlargement and improvement of shops and terminals. The labor situation in the shops of many railways, partly as a result of the strike and partly owing to conditions that existed before it occurred, is very unsatisfactory. It will require a great deal of work by the mechanical officers to give proper training to the many new men they have and complete the needed reorganization of their forces.

Among the principal prerequisites to the solution of the

numerous vital problems confronting the mechanical departments is thorough study and discussion of these problems. A free interchange of experiences and views by numerous men who are trying to overcome the same difficulties is always helpful. It is to be hoped that the convention next week will be especially characterized by such interchange of experiences and views. Meanwhile, the splendid work which has been done by the mechanical departments during the last year indicates they may be relied upon to be found equal to the performance of the heavy tasks which still await them.

A Unique Convention

A railroad convention of a rather unusual type was held at Atlantic City on Friday and Saturday of last week. The representatives of the railroad employees' magazines, or newspapers, gathered for the second time to talk over their problems. The first meeting was held at Richmond a year ago and was undoubtedly responsible to a large degree for many of the improvements which have been noted in employees' magazines during the past year. The fundamental purpose of these magazines is to create a better understanding between the managements and the employees. The different papers, varying from so-called bulletins and bi-weekly newspapers to more or less elaborate monthly magazines, have each been able to make considerable progress in certain directions and each one can be greatly helped by learning of the experiences, good and bad, of the others. After the first session on Friday morning, one of the representatives who had come all the way from the Pacific coast to attend the meeting, declared enthusiastically that he had gotten enough constructive suggestions from the one session to make his trip well worth while. The meeting was unique in that while reports and special addresses had been arranged for, the whole affair was more or less informal. The representatives spoke their minds very freely and frankly. The employees' magazines have great possibilities before them, particularly now that the importance of the personnel problem on the railroads is becoming more clearly recognized. If conducted in the proper spirit and if advantage is taken of the experiences of employees' magazines in the industries as well as in the railroad field, they can be a large factor in improving the efficiency and economy of operation, through creating a closer contact and better understanding between the managements and the men.

Let Paint-Makers Prepare Specifications

Paint specifications have been a cause of controversy between the railways and the paint manufacturers for many years. The manufacturers have contended that the roads are not able to prepare specifications which will protect them against the unprincipled producer who, from his more intimate knowledge of paint making, can so manipulate his materials that the use of inferior ingredients will not be disclosed in any tests imposed by the specifications. Under such conditions, other manufacturers cannot compete unless they also substitute cheaper materials, and to overcome this condition, which is admittedly unsatisfactory, most manufacturers are urging the use of their trade mark products, backed by the reputation of the firms and their guarantees. While this insures quality it eliminates competition, producing a situation which is obviously undesirable from the standpoint of the purchaser and has been more largely responsible than any other single factor for the purchase of paint under specifications. In view of the chaotic situation thus presented, would it not be pertinent to suggest that it behooves the producers to take this matter in their own hands by collective action? There is an abundance of precedents for this. Manufacturers in many lines are now engaged in the establishment of standards and specifications for their products for no other reason than that all efforts to this end on the part of the consumers have proved impotent or impracticable. Just how far such efforts for the standardization of paint may be carried is problematical, but we venture to suggest that much could be done in the preparation of a common ground of understanding that would afford a reasonable basis for competitive sales without depriving the manufacturer of his right to exploit the particular merits of his own product. The initiative rests with the producer.

Electrical Department Organization

Electrical department organization is a matter which can well be given attention by a majority of the railroads. A few roads have organizations of which they may justly be proud, but there are many more of which it may be said that their departments are well but not thoroughly organized. This may be explained about as follows: There is an obvious need for well defined departments. Particularly where there is a possibility of injury to persons or property, high departmental walls must be set up so that certain persons, and no one else, are responsible for practices and for maintenance of equipment. Unfortunately such organization tends to make for much duplication of effort. Where the department is large and well organized the efficiency is greatly improved because where the matter of responsibility is not vital, work can be divided up and done by the forces most conveniently located. Regarding lack of organization, the electrical department is probably the worst offender, but it is neither the fault of the department nor of the railroad. The first railroad was put in operation nearly 100 years ago. The trains were hauled by steam locomotives, the shop machinery was run by steam engines and electrical apparatus as a practical asset was unknown. As electrical apparatus was developed, it was adapted by each of the several already well developed departments and this practice to a considerable extent has continued. Now nearly 99 per cent of the track of the Class I roads is still steam operated, but there is scarcely a machine tool that is not motor driven; buildings and yards are electrically lighted, locomotives and passenger cars carry their own electric power plants, electric power is used extensively for welding and cutting of metals and for the operation of pumping plants and air compressors, while more recently electric power has found an important place in the operation of automatic train control. At the last exhibit of the Railway Supply Manufacturers' Association, 30 per cent of the exhibitors were showing apparatus for railroad use which was in part at least electrical. There is an obvious need for heading up this rapidly increasing branch of the industry and suggestions for the solution of the problem are needed.

Telling the Public How to Travel

In a recent bulletin placed in its cars the Pullman Company advises passengers of the proper manner in which to stow their baggage and also how it should be marked for easy identification. This is institutional advertising of a most desirable type and is an example which the railroads might well emulate. Passengers are told of the maximum size of baggage which will fit under Pullman seats. If the traveling public were generally informed of this size, and would keep it in mind when purchasing bags and suitcases, they, the

Pullman Company and the railroads, would find the business of travel much simplified. The railroad is, of course, interested in having the passenger carry, rather than check, as much of his baggage as he conveniently can. It is not to the advantage of the railroad, however, for passengers to carry into the Pullman cars the miniature trunks which some of them now affect. Bulky luggage of this kind serves only to crowd quarters already none too spacious, detracting from the comfort of travel. The Bell telephone companies and other large enterprises have made great gains in public favor by instructing the public in the best methods of utilizing their services. Similarly if, by being properly informed, the public is able to travel with a minimum of trouble and inconvenience, the popularity of the carriers will be so much enhanced.

A New Picture of the Highway Crossing

Death for carelessness! This is a common penalty in one court; that court wherein the offense, the trial, the verdict, the sentence and the penalty are combined in a single process. It is the grade crossing. The offender who, one moment, is an innocent citizen, the next a law-breaker, and the next a terror-stricken victim, is punished with death before he has time even to think. This idea is embodied, though rather imperfectly, in a recent newspaper cartoon. The sternness of the judge and the nearness of the graveyard are well set forth. But the picture is noticed here for the purpose of entering a protest. The judge of the court is named "The Railroads"; it is the railroad that kills the thoughtless wayfarer. But is it really the railroad that fixes the penalty? No; it is society. The railroad companies are, indeed, a part of society, but only a part. The penalty automatically results from the fact that the weight and speed of the locomotive and cars are so great that the train cannot be stopped except after the lapse of some little time. And for this condition *society is responsible.* The persons in the fast passenger train, or the loads of merchandise in the ponderous freight train, are there because the people—society—have decided, definitely, that that is the proper and desirable method of conveyance from place to place. The railroad, as such, is not responsible—even in part—for crossing casualties unless it disobeys the mandate of the people in regard to the speed of its trains. The cartoonists are a great force in the world; but there are some subjects connected with railroad operation that no single cartoon can ever grapple with. The relations of the railroads to the public have many intricate complications; nothing less than a six-reel motion-picture should attempt to cover them.

Blue-Coats at Highway Crossings

Statistics showing the number of persons killed and injured by getting in the way of fast trains, tell only a part of the story of recklessness and anxiety connected with grade-crossing dangers; the persons who deliberately challenge the supremacy of the hundred-ton locomotive and who, many times, "get away with it" are very numerous; and they need to be curbed and warned. To carry out suitable warnings and to do it more effectively, the New York, New Haven & Hartford has assigned uniformed police officers to a number of crossings, where the need of warning arises frequently, and proposes thus to try to educate the people of Southern New England. There is great need of this education in many states. The ordinary crossing flagman is not always an imposing personification of the majesty of the law. The story of the New York Central crossing watchman who resigned his job because reckless drivers persisted in trying to kill themselves in spite of his warnings was not all fiction, by any means. That watchman was perhaps too sensitive, and not exactly the kind of man for such a place. Others are not sensitive enough; not alert to learn. We noted one the other day—on a road which has numerous level crossings and ought to know how to train its men—who held his disk with its edge toward approaching travelers on the highway. But, whatever the degree of native ability possessed by the watchman, a policeman's uniform is a help. Offenders, in a majority of cases, no doubt, are of that crude mental makeup that can be aroused to duty and decency only by a club and the authority that, usually, goes with a club. The New Haven proposes to employ the policeman as a reinforcement to the regular watchman, not as a substitute; and intermittently, not constantly. No railroad can afford to furnish a police officer at all crossings all the time. As with ordinary city policing problems, the need, measured by ideal conditions, is greater than any financial budget maker has ever dared fully to meet.

Car and Locomotive Orders

THE RAILWAYS of the United States placed orders in the first five months of 1923 for 1,598 locomotives, 65,699 freight cars and 1,250 passenger cars. Orders reported in the first two issues of the *Railway Age* in June bring these totals up to date to 1,684 locomotives, 67,209 freight cars and 1,300 passenger cars. The larger part of these orders were placed in the first three months of the year, the buying movement having ceased practically thereafter. The orders in May were particularly small. The figures by months follow:

DOMESTIC ORDERS

Month	Locomotives	Freight Cars	Passenger Cars
Jan.	358	11,025	559
Feb.	486	10,266	122
Mar.	514	34,514	291
Apr.	150	9,744	179
May	90	150	99
Total—5 mos.	1,598	65,699	1,250
June 1—2 wks.	86	1,510	50
	1,684	67,209	1,300

The Car Service Division of the American Railway Association reported recently that the railroads reporting to it put in service from January 1, 1923, to June 1, 1923, 50,151 freight cars and 1,228 locomotives and that there were still on order May 1, 115,756 freight cars and 1,956 locomotives. The latter large figures show the effect of the heavy buying movement of the latter months of 1922 and of the first three

FREIGHT CARS

Hopper	21,065
Box	16,070
Gondola	11,450
Automobile	6,150
Refrigerator	5,150
Tank	1,784
General Service	1,150
Ballast	1,050
Flat	950
Logging	625
Stock	500
Milk	200
Caboose	135
Total	66,279

Includes week ending June 9, 1923.

LOCOMOTIVES

Mikado	444
Decapod	375
Santa Fe	147
Switching	173
Pacific	144
Mountain	136
Mallet	53
Consolidation	56
Ten-Wheel	40
Other	30
Total	1,598

Includes week ending June 9, 1923.

months of 1923. Of course, as these orders are being filled, old and worn-out equipment is gradually being retired so that it is problematical as to what the net result will be for the year. It has been thought that the large purchases would, however, be sufficient so that as a final result there will be an increase in the amount of equipment on the railways or, at any rate, an increase in the railways' total locomotive tractive power and total freight car capacity. At the end of 1921 the number of freight cars owned by the Class I railways was less than it was at the end of 1918 and the total freight car carrying capacity less than at the end of 1919. The number of locomotives was less than at the end of 1919 but the total tractive effort was greater. The last detail, however, was not true of all the steam railways of the country. Figures given elsewhere show that for all roads there was an actual decrease in locomotive tractive effort as of the end of 1921 for the first time in the country's history.

For the purpose of observing the trend of the orders to date this year a compilation has been made of the orders by types. The figures include all orders for 5 or more locomotives and 100 or more freight cars and are given in the tables. In the freight car list the striking feature in the orders placed so far this year is the large proportion of open top cars. The locomotive compilation is signalized by the predominance of freight locomotives, particularly of the Mikado and Decapod types.

Buying vs. Making Small Standard Shop Tools

THE AVERAGE railroad shop cannot expect to make with profit its own reamers, milling cutters and other standard cutting tools obtainable in the open market. Certain special tools must be made in local railroad shops, and far better equipment for machining and heat treating these tools is needed than that now available. To be specific, there is a lack of modern universal milling and grinding machines, furnaces with automatic temperature control, pyrometers, oil baths, lead baths and other quenching mediums in many shops which nevertheless attempt to make and heat treat their own high speed steel cutting tools. The bulk of standard cutting tools used in railroad shops should be purchased, however, since a manufacturer who specializes in these tools and makes them in large quantities is in a far better position, both as regards equipment and skill, to turn out high-grade tools cheaply than is possible in any railroad shop. With all due respect to railroad mechanics and tool makers, there are bound to be refinements in the manufacture of these tools which can be learned only by long specialized experience.

Too often railroad shops are not equipped to repair the tools, let alone make them. In a recent case a railroad purchased from a well-known manufacturer and was obtaining valuable results with a high-speed steel tool, known as a crosshead pin seat reamer. This reamer was accidentally broken in the shank and sent to the shop toolroom for repairs. After being annealed the reamer body was bored out and a new shank fitted, but, in retempering, the reamer was broken through its body due to being tempered too hard. According to the account "Since this happened, they have been making all their own reamers at this shop." Is it not significant that a railroad shop which could not anneal and retemper a special reamer without breaking it should attempt to manufacture all its own reamers?

Although not so stated, the reason for this state of affairs in the case mentioned may have been the difficulty which the shop management experienced in getting appropriations for needed new tools. Possibly the appropriation for small tools was exhausted. One thousand dollars could not be found to buy new tools so the railroad made less satisfactory ones at a cost of two thousand dollars. This practice is not countenanced, and few railroad officers will admit its existence but the fact remains that when a new tool is badly needed to expedite shop output, the local management frequently has the tool made rather than submit to the delay involved in making a formal requisition which may be turned down after all. Two things are needed to improve this situation: (1) A more elastic financial arrangement to cover unexpected and emergency needs for new shop tools, and (2) better equipment for machining and heat treating such special tools as cannot be purchased in the open market.

Trend of Railway Earnings

THE IMPROVEMENTS in the net operating income of the railways shown in April was notable. The net return earned in that month was at an annual rate of 6½ per cent on their valuation. It made the return earned in the four months of the present year run at the annual rate of 5.49 per cent.

While the net financial results being secured by the railways as a whole is increasingly gratifying, it is notable that the railways in the eastern and southern districts have been doing much better than those in the western district. The net return earned by the railways in the eastern district, including the Pocahontas region, in April was at the rate of 7.93 per cent annually, and in the southern district it was at the rate of 7.18 per cent annually. During the first four months of the year the railways in the eastern district earned at the rate of 6.31 per cent annually and those in the southern district at the rate of 6.08 per cent annually. On the other hand, in April the railways in the western district earned at the rate of 4.52 per cent annually, and during the first four months of the year, at the rate of only 4.13 annually.

A study of the statistics shows that the western lines are suffering both from failure of their traffic to increase as much as in other territories and from the fact that their average freight rate has not been increased as much since before the war as that of the railways in other territories. The car loadings of the railways of the entire country showed an increase from January 1 to May 27 over the car loadings of the same part of 1920 of over 13 per cent. The car loadings of the western lines meantime showed an increase of only 5½ per cent. The total earnings and net operating income of 1923 can best be compared with those of 1917, since that was the last year of heavy business throughout which the railways were operated without government guarantees. In the first four months of 1917 the total earnings of the Class I railways were $1,194,000,000, while in the first four months of 1923 they were $2,007,000,000, an increase of about 68 per cent. The total earnings of the western lines in the first four months of 1917 were about $480,000,000, and in 1923, almost $705,000,000, an increase of only 47 per cent. The net operating income of the Class I railways in the first four months of 1917 was $254,000,000, and in the first four months of 1923 it was $266,000,000, which was a small increase. On the other hand, the net operating income of the western lines in the first four months of 1917 was $119,500,000, while in the first four months of 1923 it was only $82,300,000, or $37,200,000 less.

The failure of the traffic of the western lines to increase as much in proportion as that of the railways in other districts is doubtless due to two causes. One of these is the competition of the ships through the Panama canal, which has prevented the western lines from getting a large amount of business which they otherwise would have obtained. The second reason doubtless is that there has been less improvement in general business conditions in the central western

and northwestern parts of the country than elsewhere because of the unfortunate position in which the grain farmers have found and still find themselves. It is certainly an unfortunate feature of the railroad situation that it is in the very part of the country where the railways are making the least satisfactory showing financially that there is the most hostile sentiment toward the railways, and the most insistent demand for reductions of rates.

A Scientific Freight Car Rebuilding Program

THE DIFFICULTIES in maintaining freight cars in recent years have focused attention upon the necessity of tackling this whole problem in a decided fashion and of doing something to keep more of these cars available for service. The business of the country is growing at a more rapid rate than is the enlargement of railroad facilities for handling this business. It will be necessary if the railroads are to serve the public acceptably, that the best possible use be made of every piece of equipment. It is true that much can be gained by better co-operation on the part of the shippers, but it is true, also, that the railroads have a large responsibility in keeping the equipment in the best condition and having as large a percentage of it as possible available for use at all times.

In general, a freight car requires heavy repairs or rebuilding about once every eight years. In addition to the deterioration of important parts, it is necessary in these general overhaulings not only to replace these parts, but also to overcome obsolescence in design. On this basis, about 12½ per cent of the freight cars should be rebuilt and brought up to date every year. Such figures as are available indicate that few roads have conformed to this practice in the past and that therefore there is a large amount of deferred maintenance, and many of the older cars are being operated without improvements which should be made if they are to give satisfactory service. The fact that the cars are not being rebuilt at the proper intervals means that the equipment as a whole is not averaging as well as it should in car-miles per day, or in car-days in service.

It is difficult to get the management to realize the necessity of taking steps to remedy this situation unless a very complete survey is made of the freight car equipment on each road, including a thorough study of each class and type of equipment and a fairly complete knowledge of the condition of all of the cars in each class. This information is not easy to obtain, and in any event will require considerable study in order to digest it and draw the proper conclusions.

Studies made by one road indicate that after all of the facts have been ascertained, it is wise to select that class of car which is most greatly needed and concentrate in the rebuilding program on that class until all of the cars in it have gone through the shop. This has several advantages. It not only takes care of the class of cars which is most needed at the time, but the material can be ordered and handled in large quantities and the workmen can turn out the cars more efficiently than if several classes were being rebuilt at one time.

In some cases so many of the cars have gone beyond a reasonable period for rebuilding, or if they have been rebuilt, have not had the latest improvements made, that the adoption of an adequate program will require heavy appropriations to be made for the next few years. It must be recognized, however, that after these improvements are made the annual expenditures will be much less, because if a regular schedule is followed, the equipment will be maintained in a much better condition and with a very low percentage of bad order cars. This in itself will be a paying proposition, because it will add greatly to the available equipment in times of heavy business.

In developing a rebuilding program climatic conditions must be taken into consideration, as well as the repair facilities which may be made available. A great many railroads do not have sufficient facilities properly to take care of the equipment. Where much of the work must be done without proper shops or shelter, it will be necessary to schedule the greater part of the work during seven or eight months of the year and operate on a much lighter schedule during the more severe winter months.

The survey will also bring to the forefront the necessity of equipment retirements. It is the general practice to utilize all cars as long as they are serviceable. There comes a time, however, when it is not advisable to improve or rebuild the cars and by placing a limit of repairs at any one time on these cars, they will ultimately come up for authority to retire. A certain amount of material may be reclaimed which can be used on new cars which may be constructed to replace them.

Cars, the rebuilding of which has been unreasonably deferred and which are being maintained in service by the making of light repairs when they should be rebuilt, cause a heavy loss in the car-days out of service. This can sometimes be shown in a striking manner by taking each class of cars and comparing the number of cars in each class repaired in a given period, say one month, with the total number of cars in the class. The frequency of repairs per month or the average number of times each car is repaired in a month will often tell a striking story and will point out the need of tackling this problem drastically and making much needed improvements. For instance, here are the figures for the various classes of cars on one system:

	Frequency of repairs per month or average number of times each car was repaired
Box	.91
Furniture and carriage	.33
Automobile	.16
Refrigerator	1.63
Vegetable	.86
Stock	1.73
Flat	2.30
Coal	.85
Ore	.46
Caboose	2.03
Miscellaneous	.69
System cars	1.01
Foreign cars, approximately	1.22

Something is surely wrong when repairs must be made so frequently on some of these classes of cars. The figures, in themselves, emphasize the need of a thorough survey of the condition of the equipment and a constructive program for improving its condition.

The Politicians' Attempt to Embarrass C. N. R. Management

THE CANADIAN PARLIAMENT last week witnessed a disgraceful—and, fortunately, unsuccessful—attempt on the part of politicians to interfere in the management of the Canadian National Railways. The C. N. R., through its European representative, has acquired the Hotel Scribe in Paris. It does not propose to hold the property, but to sell it to a syndicate, reserving space therein under lease.

The purchase was only a matter of form and for the purpose of securing centrally-located premises for the railways' offices in Paris—an ordinary business transaction which the directors of a private enterprise might enter into without hesitation. The opposition in Parliament, however, seized upon the opportunity to criticize the C. N. R. management for "mis-appropriation of funds" and to move

that appropriations for the railways be deferred until Sir Henry Thornton, president and chairman of the board, should give the details of the transaction, as yet uncompleted, to Parliament. This motion was ruled out of order and another similar motion which came to a vote was overwhelmingly defeated.

The Canadian National Railways are organized as much like a privately-owned railway as is possible. The bureaucracy, usually in control of government railways, is absent. The president and directors operate the property as they see fit, reporting to the stockholders. But there is the rub! The stockholders are the people of Canada, who are represented by Parliament. The stockholders of a privately-owned railway interfere with the management only to the slight extent of gathering once a year and electing directors; they concern themselves little with the details of the management of their property. Parliament, on the other hand, is in session most of the time and there are some members apparently who want to know in detail every transaction made by the management.

The element of superiority which the C. N. R. has over most government-owned railways is the extent to which it has been able to simulate the organization of a private property with experienced railroad men in charge, unhampered by bureaucracy. Apparently this is not enough. If the management is to have the same freedom that the management of a private enterprise would have, then Parliament will have to limit its interest in the conduct of the properties to that shown by the stockholders of the average private company. The Canadian people can well give their hearty support to the policy of the government, outlined by Mr. Mackenzie King, the Prime Minister, as follows:

"We propose to give Sir Henry Thornton in this and every other transaction precisely the same degree of latitude and freedom as the shareholders of the Canadian Pacific Railway would give to Mr. Beatty."

Get More Out of the Designer

"THE WORK of the designer calls for a high degree of mental attainment, but it gives a man such a narrow outlook on life, that I made up my mind to get into other employment that would afford me more opportunities to meet people." This statement by a railway vice-president clearly defines the present predicament of a small but important group of highly trained men in the technical departments of the railroad and accounts for the difficulties experienced in holding the more ambitious and enterprising among them in this service. Because the work of these men, as now organized, requires them to deal with the forces of nature rather than human nature, a condition that breeds diffidence, there is a tendency on the part of some persons to assume an attitude of disparagement toward them, to apply the term draftsman in a sense that implies the pursuit of a mechanical craft. Yet, it is on the chief draftsman and his principal assistants that the railway managements must depend for the design of bridges, buildings and machinery in a manner that will insure the most economical and effective expenditure of the large sums of money appropriated for capital investment. It is largely because these men have not had time to forget their mathematics, that railway facilities have reached the present high state of development they possess. The so-called "practical" man could, no doubt, design a modern engine terminal or shop, but as another railway officer has expressed it, "The structure built that way may be strong enough, but we cannot always be sure of it, and it is pretty certain that it will not be economical."

The office man is criticized as being impractical, but this is not so much his fault as that of the system under which he is employed. There is too much of a tendency in some quarters to keep the designer at his desk and have him rely on the written or verbal reports of the field man or on the head of the department, the engineer of buildings, for example, for that contact between the field and the office which is presumed to insure the preparation of a design that meets the practical requirements. But this is not feasible under present day conditions. The volume of work being conducted in the designing office is so great and the details of the work are so intricate that it is not within the capacity of the men at the heads of the departments to be thoroughly conversant with all of them. The only reasonable procedure under the circumstances is to give the designer that degree of personal contact with the work which will insure that he is familiar not only with the working requirements of the design, but also with the limitations of construction practice.

It is possible, of course, to reproduce standards of conventional design thoroughly tried by experience without occasion for this contact with the roundhouse foreman, the supervisor of buildings or other men on the firing line, but if progress is to be made in the development of new or improved facilities, this intimate contact between field and office is absolutely necessary and never more so than at present when the railroads are doing their utmost to provide facilities better to meet to the demands of transportation imposed on them. Moreover the pursuit of this policy would develop a class of designers with a broader outlook. They would be men who would take a greater pride in their work, and show a greater interest and enthusiasm in the real business of transportation.

Is a Central Tie Inspection Bureau Feasible?

THE RAILWAYS spend more money for cross ties than for any other single item of material except fuel. The characteristics which they require in ties are fairly uniform and readily defined. Yet in spite of the large expenditures for this essential element in track construction and the similarity in the service to which the ties are subjected on different roads, it was not until the government brought the railways under common control in 1918 that a uniform specification for ties was drawn up and made effective on all roads. Since that time these specifications with slight modifications have been adopted by the American Railway Engineering Association, representing the users, and by the National Association of Railroad Tie Producers', representing those who make them. Most of the railways have also incorporated the provisions of these specifications, in substance, if not in exact form, in their own specifications under which they are now buying their ties. With such general support, it would seem that uniformity and stabilization in tie production would be assured.

However, any specification is of value only to the extent to which its provisions are enforced by fair and uniform inspection. It is here that the American Railway Engineering Association tie specifications are falling short today and that their future usefulness is in danger.

Tie production has long been subjected to wide fluctuations depending on the rise and fall of railroad demand. Although the deterioration of ties is relatively uniform and largely independent of traffic, their renewal varies in large measure with the volume of business and of resulting earnings. The result is alternate periods of large and small demands for ties and an almost constant demoralization of the tie producing industry, with the producer in a precarious position in times of light demand and in a dominant position when the tables are reversed. When demand is exceeding

production, the roads have always engaged in frantic competition with each other, waiving the provisions of their specifications in part, if not almost in their entirety, by means of lax inspection in order to secure their requirements. When the conditions are reversed and production exceeds demand, the inspection goes to the other extreme with the object of reducing to the minimum the number which the roads must accept. In other words, while the wording of the specifications under which the ties are bought may be uniform from one year to another, the character of the inspection varies so widely as to make the specifications themselves largely ineffective. Under such conditions a producer cannot afford to build up a permanent organization and bring out ties at a fairly uniform rate (the condition under which lowest costs are incurred) in advance of definite orders, for he cannot anticipate the character of inspection to which he will be subjected.

While the present conditions in the tie producing industry are such that the seller is dominating the market the large operators realize that this condition is temporary and that there will soon come a time when the tables will be reversed. They also realize that the wide fluctuations in their industry do not contribute to economy of operation and add a large amount to the sum which the railways must pay for their products. There is, therefore, a considerable sentiment among them in favor of the creation of a central inspection bureau whose grading will be recognized by purchaser and producer alike and whose inspection will be uniform in times of shortage and over production. Some have suggested that as all ties, with the exception of a relatively small number used by the electric railways, go into steam road tracks, the American Railway Association is the proper organization to foster an inspection bureau and that if it created an organization headed by a man of recognized standing in the field, its work would inspire confidence. Others, fearful of the possibility of bureaucratic methods, favor the placing of this inspection in the hands of one or more private companies which would gain recognition for their inspection and a demand for their service by the merit of their work. Still others believe that the producers, who suffer most directly and most acutely from the present lack of uniformity, should initiate the steps for the creation of this bureau and perhaps establish and support it.

It is evident that there is need for a uniform application of the provisions of the general specification for ties as between roads and from year to year. The railways, as practically the sole purchasers of cross ties, must of necessity pay the cost of production. They, therefore, suffer from any conditions in the tie industry which tend to increase the cost of manufacture, and it is to their interest to co-operate in the development of any plan which will reduce this cost. No single influence contributes more to the unnecessarily high cost of ties than the wide fluctuations in demand. Since these fluctuations are dependent in large measure on the earnings of the railways, it may not be possible to eliminate them entirely. However, if a uniform inspection was insured many, if not most, of the large producers of ties would proceed with a uniform production, storing the surplus produced during periods of limited demand until the roads require it. While the method of developing uniform inspection may, therefore, be open to debate, the advantages of the objective are so great as to warrant detailed study.

EVERY PRACTICABLE means of preventing the abandonment of the Chicago, Peoria & St. Louis is being tried by patrons of the line. A committee of business men residing in the territory served by the road was appointed at a conference held by the Peoria Association of Commerce to organize and unite the patrons for concerted action. At a gathering of newspaper editors and publishers from cities along the line held in Springfield, Ill., on June 4, it was decided to try a thorough publicity campaign.

New Books

Standard Business Dictionary by Julius Spiegel. 477 pages. 5½ in. by 8 in. Bound in cloth. Published by the Standard Publishing Company, New York.

The paper jacket on this book calls it "10 dictionaries in one" and says that it "defines all terms, phrases and colloquialisms used in the practice of accounting, banking, commerce, economics, finance, foreign, history, law, legislation, transportation." This claim may seem slightly exaggerated, but we shall not attempt to pass judgment on its claims with reference to defining all terms used in all the fields it says it has covered. The claim that it gives all terms, phrases and colloquialisms of transportation, however, is decidedly exaggerated. Many a junior railroad clerk is familiar with more technical words and phrases relating to transportation than can be found in this book. As a dictionary on transportation for a railroad man the book is, in our opinion, practically valueless. It is worse than that; it is inaccurate. Witness:

"Interstate Commerce Commission—A commission created by the interstate commerce act to carry out the measures therein enacted, composed of *five* persons. . . ." (Italics ours.)

As a general dictionary of business, business law and finance, however, the book can lay claim to considerable merit. It seems to have covered these fields with thoroughness and accuracy. If it would restrict its claims to those fields and not be so all-inclusive, little but praise could be said of it.

A List of New Books and Special Articles of Interest to Railroaders

(Compiled by Miss E. O. Cullen, Reference Librarian, Bureau of Railway Economics, Washington, D. C.)

Books

THE INTERSTATE COMMERCE COMMISSION, ITS HISTORY, ACTIVITIES AND ORGANIZATION, by Joshua Bernhardt. Institute for Government Research. Service monographs of the United States Government, No. 18. 169 pages. Published by the Johns Hopkins Press, Baltimore, Md.

INDUSTRIAL HISTORY OF THE UNITED STATES, by Edward S. Cowdrick. Chapters 11, 21, 22, 27 and 37 discuss railroad development and problems. 414 pages. Published by The Ronald Press Company, New York.

INDUSTRIAL DEMOCRACY, A PLAN FOR ITS ACHIEVEMENT, by Glenn E. Plumb and William G. Roylance. Discussion of the expanded "Plumb Plan" and its purposes. 359 pages. Published by B. W. Huebsch, Inc., New York.

PIONEER RAILWAY ENGINEERING, by H. Stringer. The author is a resident engineer for the Peking-Mukden Railway and the book describes methods used for railroads in undeveloped countries. 269 pages. Published by H. F. & G. Witherby, London.

Periodicals

THE ARICA-LA PAZ RAILWAY, by F. E. Benjamin. Commerce Reports, June 11, 1923, pages 711-712.

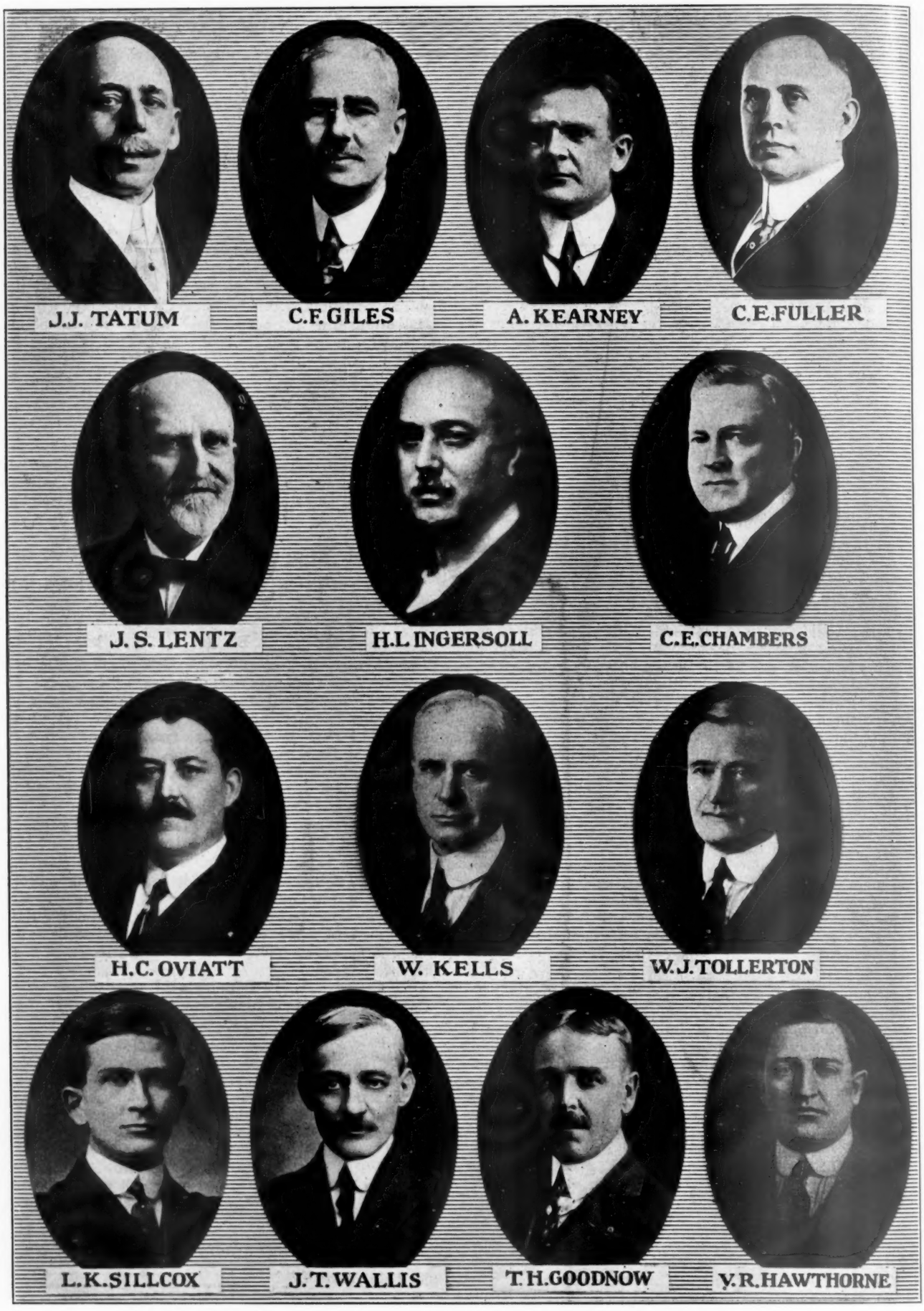
THE FANTASY OF THE "LIVING WAGE," by Ben W. Hooper. Nation's Business, June, 1923, pages 16-18.

WHO ARE THE RAILWAYS? (1) SMITH OF THE NEW YORK CENTRAL. By Edward Hungerford. Collier's, June 2, 1923, pages 11-12; editorial comment on page 30.

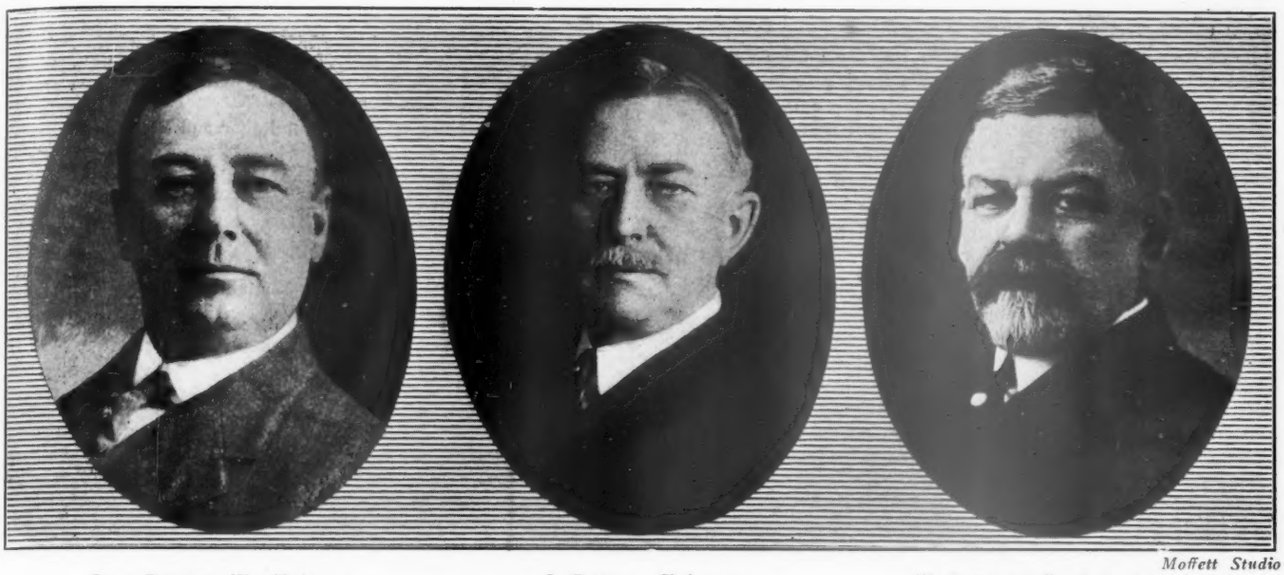
RAILWAYS AND ROADS IN NORTH BORNEO, by G. C. Irving. Far Eastern Review, April, 1923, pages 232-234.

LABOR "REARING" TO GO INTO POLITICAL ARENA, by Basil M. Manly. Discussion of causes and plans by members of progressives. New York Evening Post, June 2, 1923, page 13.

COUZENS, RADICAL AND RICH, by James B. Morrow. The history and aims of Senator Couzens. Nation's Business, June, 1923, pages 22-23.



Members of Gêneral Committee of the Mechanical Division and Secretary Hawthorne



Moffett Studio

JOHN PURCELL, Vice-Chairman — J. COLEMAN, Chairman — W. B. STOREY, Ex. Com. A. R. A.

Mechanical Division Annual Meeting at Chicago

Important Reports and Papers on Subjects of Vital Interest Included in Program for Next Week

A MEETING, unique in the history of the Mechanical Division of the American Railway Association and in the recent history of its predecessors, the Master Car Builders' Association and the American Railway Master Mechanics' Association, will be held at Orchestra Hall, Chicago, on Wednesday, Thursday and Friday, June 20-22. This meeting, which is designated as the annual meeting of the Mechanical Division, is the fourth convention held since the organization of the Mechanical Division, the fifty-fifth since the organization of the Master Car Builders' Association, and the fifty-fourth since the organization of the American Railway Master Mechanics' Association.

This is not the first time in recent years that the customary annual conventions of the two associations now forming the Mechanical Division have been replaced by annual meetings. During the war, it will be remembered, no meeting of either organization was held in 1917, with the exception of an executive committee meeting of the Master Car Builders' Association, at which the necessary business of the association, usually taken care of at the conventions, was disposed of and arrangements made for the issuing of committee reports in proceedings of the usual form. In 1918 a joint annual meeting of both associations was held at Chicago, but the call for the meeting discouraged a large attendance, which was practically limited to the members of the executive and other committees that had reports to bring before the organizations.

The meeting this year is unique, whether compared with these former meetings or with the more elaborate conventions. In contrast with the former annual meetings, not only will a large attendance be welcome, but every effort is being made to insure that every railroad shall be largely represented. In contrast with the annual conventions which, during recent years, have all been held at Atlantic City, N. J., this year's meeting differs principally in the fact that it is being held in Chicago and will be confined strictly to the business of the Division, with neither the usual exhibit nor entertainment features.

The fact that the former programs of Mechanical Division conventions have occupied three days each in two successive weeks, while the meeting this year will be held for three days only, does not indicate a like difference in the number or importance of the subjects which will be considered. This year each day's program will be divided into two sessions, beginning at 9:30 A. M. and 2:00 P. M., except on the first morning of the convention, when the session will be called to order promptly at ten o'clock. When the meeting is adjourned, it will have completed one of the heaviest and most interesting programs in the history of the present and preceding organizations.

On November 8, 1922, the general committee of the Mechanical Division met to consider a plan for the 1923 convention. At that meeting it was finally decided to postpone the annual convention and hold a business meeting to consider reports of the committees' dealings with interchange rules and the designs for standard box cars and such other matters as were pressing for attention. In explanation of this action it was pointed out that the strike of shop employees had made it impossible for the committee of the division to organize for the prosecution of their year's work. At that time the extent to which committee work could be pushed later in the year was still doubtful. Since that time, however, conditions have rapidly improved and all of the important committees have prepared reports that will be worthy of the careful attention and thorough discussion of the members of the Division. A change in the call for the meeting, however, has not seemed desirable and it will therefore be held without the associated activities which have always accompanied the annual conventions.

But in addition to the difference in the character of the meeting, the program itself possesses a number of unusual features this year. Aside from the addresses of several well-

known executives, the program is notable for the number of subjects which will be presented to the association in individual papers. A number of subjects have also been scheduled for topical discussion which strike close to the everyday problems of all mechanical department officers.

The first floor of Orchestra Hall, in which the sessions will be held, will be reserved exclusively for railroad representatives and members of the division. Ample provision has been made for the accommodation of visitors in the balcony. Arrangements have been made for registration in the lobby of the hall and each member registering will receive a card of admission to the first floor.

The following is the program for the three days' sessions:

WEDNESDAY, JUNE 20, 1923

Meetings will be called to order by the chairman promptly at 10:00 A. M. and 2:00 P. M., Chicago daylight saving time.

Address by Chairman J. Coleman, General Superintendent Car Equipment, Central Region, Canadian National Railway.

Message from W. W. Atterbury, Operating Vice-President, Pennsylvania System.

Address by R. H. Aishton, President, American Railway Association.

Address by W. B. Storey, President, Atchison, Topeka & Santa Fe Railway.

Report of General Committee.

Report of Nominating Committee.

Individual Paper, "The Development of the Locomotive," by Samuel Vauclain, President, Baldwin Locomotive Works.

Report of Committee on Locomotive Design and Construction.

Report of Committee on Locomotive and Car Lighting.

Report of Committee on Electric Rolling Stock.

Individual Paper, "Training of Apprentices," by J. Purcell, Asst. to Vice-President, Atchison, Topeka & Santa Fe Ry.

Discussion, "Possibilities for Increasing Efficiency of Modern Locomotives."

THURSDAY, JUNE 21, 1923

Meeting will be called to order by the chairman promptly at 9:30 A. M. and 2:00 P. M., Chicago daylight saving time.

Address by C. H. Markham, President, Illinois Central Railroad.

Individual Paper, "The Development of Railway Cars," by E. F. Carry, President, The Pullman Company.

Report of Committee on Car Construction.

Report of Arbitration Committee.

Report of Committee on Prices for Labor and Materials.

Election of Officers.

Report of Committee on Brakes and Brake Equipment.

Discussion, "Co-operative Research."

Individual Paper, "Increasing of Locomotive Mileage," by C. F. Giles, Supt. Machinery, Louisville & Nashville Railroad.

FRIDAY, JUNE 22, 1923

Meeting will be called to order by the chairman promptly at 9:30 A. M. and 2:00 P. M., Chicago daylight saving time.

Address by Sir Henry Thornton, K. B. E., President, Canadian National Railways.

Report of Committee on Safety Appliances.

Report of Committee on Wheels.

Report of Committee on Specifications and Tests for Materials.

Report of Committee on Loading Rules.

Report of Committee on Tank Cars.

Report of Committee on Design of Shops and Engine Terminals.

Discussion, "Shop Management Problems of Today."

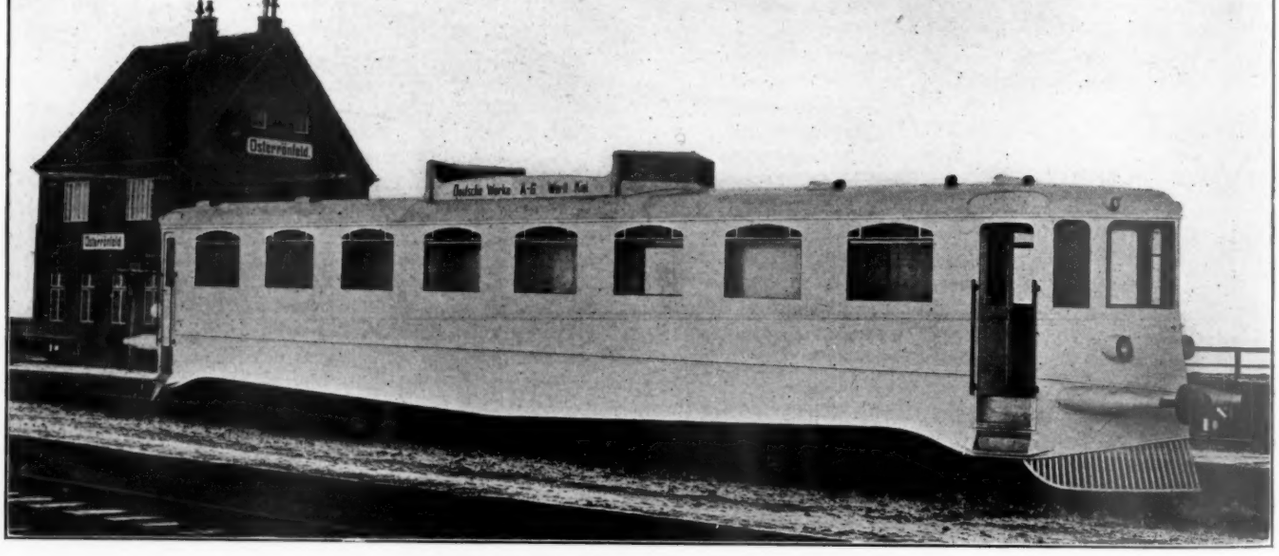
Discussion, "Economies from Modern Shop Machinery."

Discussion, "Modern Repair Track Facilities."

Discussion, "Handling of Material on Car Repair Tracks."

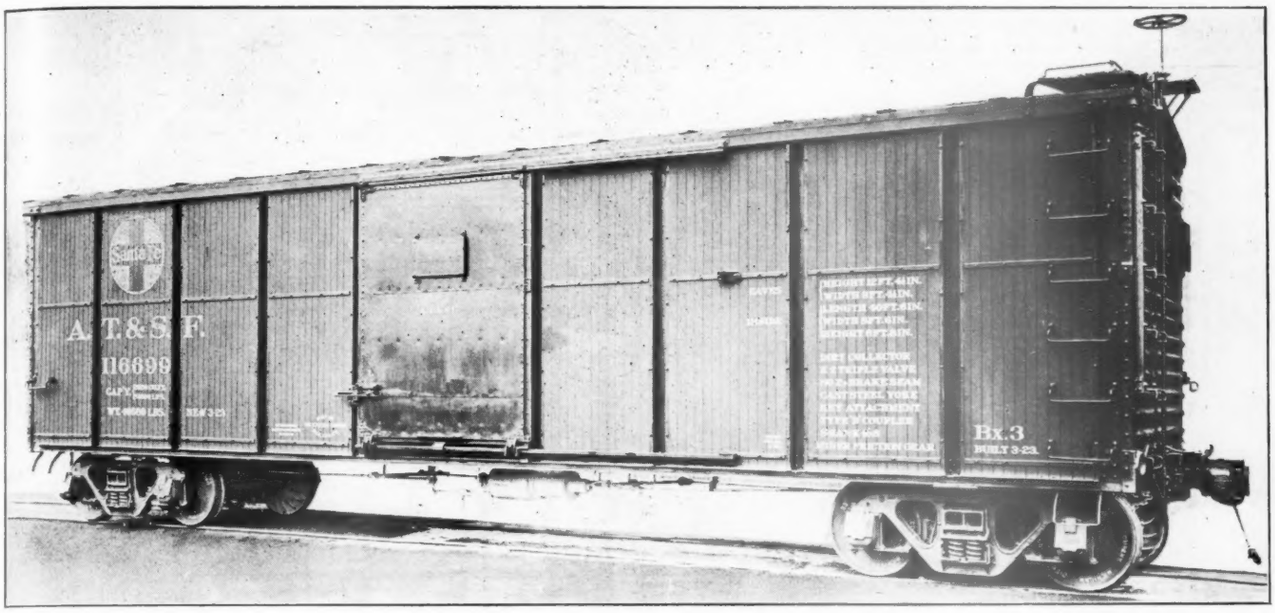
The individual papers by Samuel Vauclain and E. F. Carry, will be illustrated with motion pictures and lantern slides.

REFUSAL TO SPEAK IN FRENCH is the complaint in a suit against the Canadian Pacific at Montreal, Canada, tried before Justice Surveyer, last week. Maurice Demers, Montreal lawyer, brought suit against the railway company and one of its conductors, J. J. Flegg, for $500, alleging that Flegg refused to ask for the plaintiff's ticket in the French tongue. Demers says he declined to produce it unless so asked and that Flegg and members of the train crew jostled him and were about to attempt to put him off the train when he finally yielded his ticket. Demers asks $295 for damages to his honor and respectability, $150 for shock to his nerves, $30 for costs in making the case and $25 for trouble.



Gasoline Railway Motor Car Used in Denmark

These cars seat 36 passengers and are driven by a 100-hp. six-cylinder engine. The drive is on two axles and four speeds are provided. The cars were built by the Deutsche Werke A-G, at Kiel, Germany.



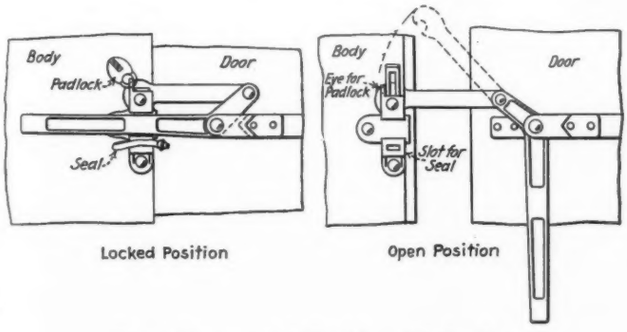
Steel Frame Box Car for Atchison, Topeka & Santa Fe

New Designs of Freight Cars for the Santa Fe

Construction Embodies New Arrangement of Side Posts, Underframe Bracing, and Door Opener and Closer

THE SANTA FE has recently placed in service new box cars of two designs—one for general merchandise, the other for furniture or automobile traffic. Of the former class, 3,000 cars have been built or are in process of construction, 1,000 by the Pullman Company, 1,000 by the American Car & Foundry Company and 1,000 by the Standard Steel Car Company; 1,000 cars of the latter class were ordered from the Pullman Company.

The outstanding feature of the construction of these cars is the sectional arrangement of the sheathing, which is fitted



Door Starter and Locking Mechanism

flush between the side post flanges. Where the sheathing extends in an unbroken expanse from door post to corner post, the cumulative effect of shrinkage has been found to result in the opening up of cracks somewhere along the side of the car. The sectional arrangement between the steel frame members localizes this effect so that cracks are unlikely to develop.

The general merchandise cars are designed with center sills of uniform cross section, the body frame being designed to carry a large part of the load. In the case of the automobile cars, however, the size of the door opening is too great to permit with safety this form of construction and therefore the fish-belly type of center sill is used.

The total weight of the merchandise car is 46,000 lb. The automobile car is slightly heavier, its weight being 50,500 lb.

The Underframes

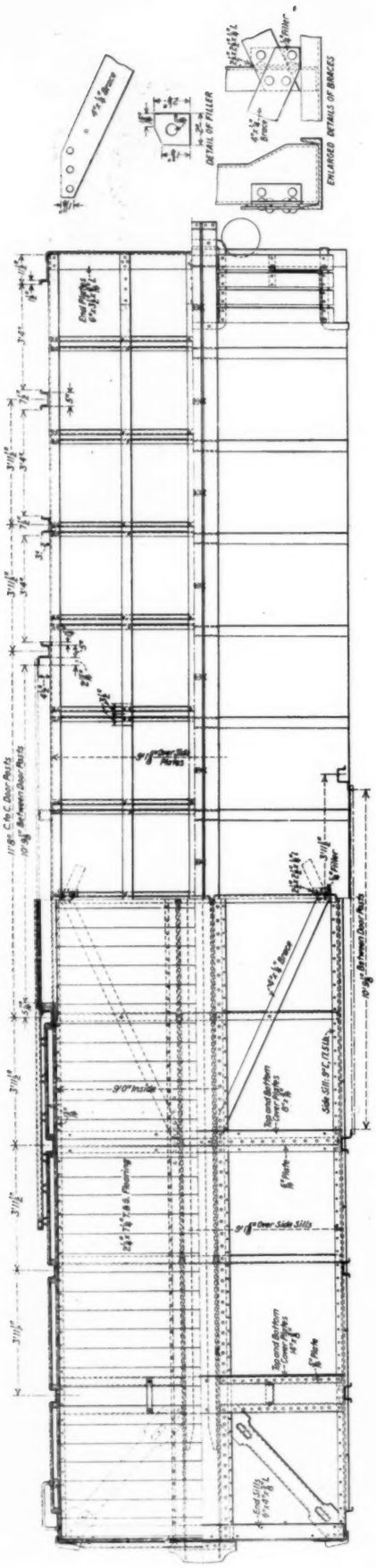
The underframes are of open-hearth steel throughout. The center sill of the general merchandise car consists of two ship channels, reinforced by a ¼-in. top cover plate; at the bottom two 3½ in. by 3 in. by ⅜ in. angles are riveted to the webs of the channel. These bottom angles extend underneath the center filler and rear draft lug combination casting.

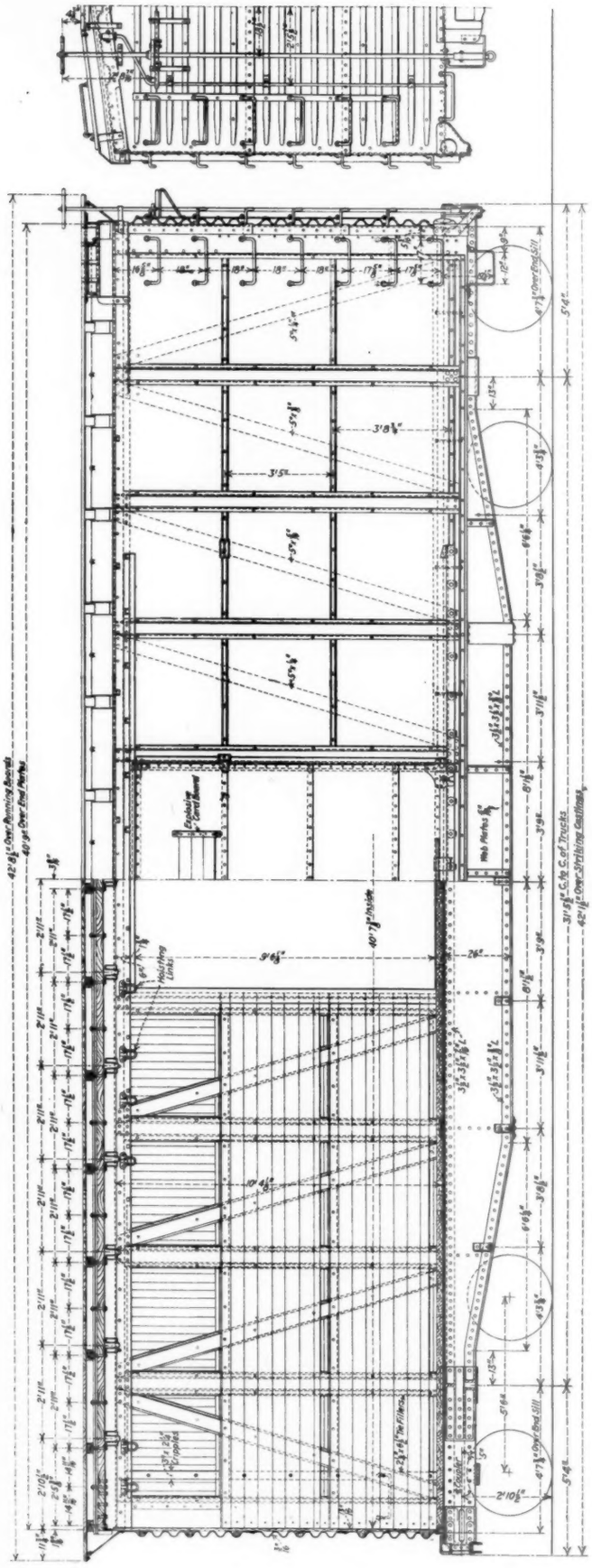
The center sills of the automobile car are of a built-up fish-belly type, consisting of 5/16-in. web plates reinforced at top on the outside by 3½ in. by 3½ in. by 7/16 in. angles and at bottom on outside and inside by 3½ in. by 3½ in. by ⅜ in. angles. The sills are also reinforced on top and connected together by a ¼-in. cover plate.

The side sills are of 9-in., 17.5-lb. channels and have angles riveted to the outside faces. The end sills are of 6 in. by 4 in. by ⅜ in. angles and are riveted to the side sills, diagonal braces and center sills. Malleable iron corner-castings and push-pole pockets are riveted to the end sills and side sills.

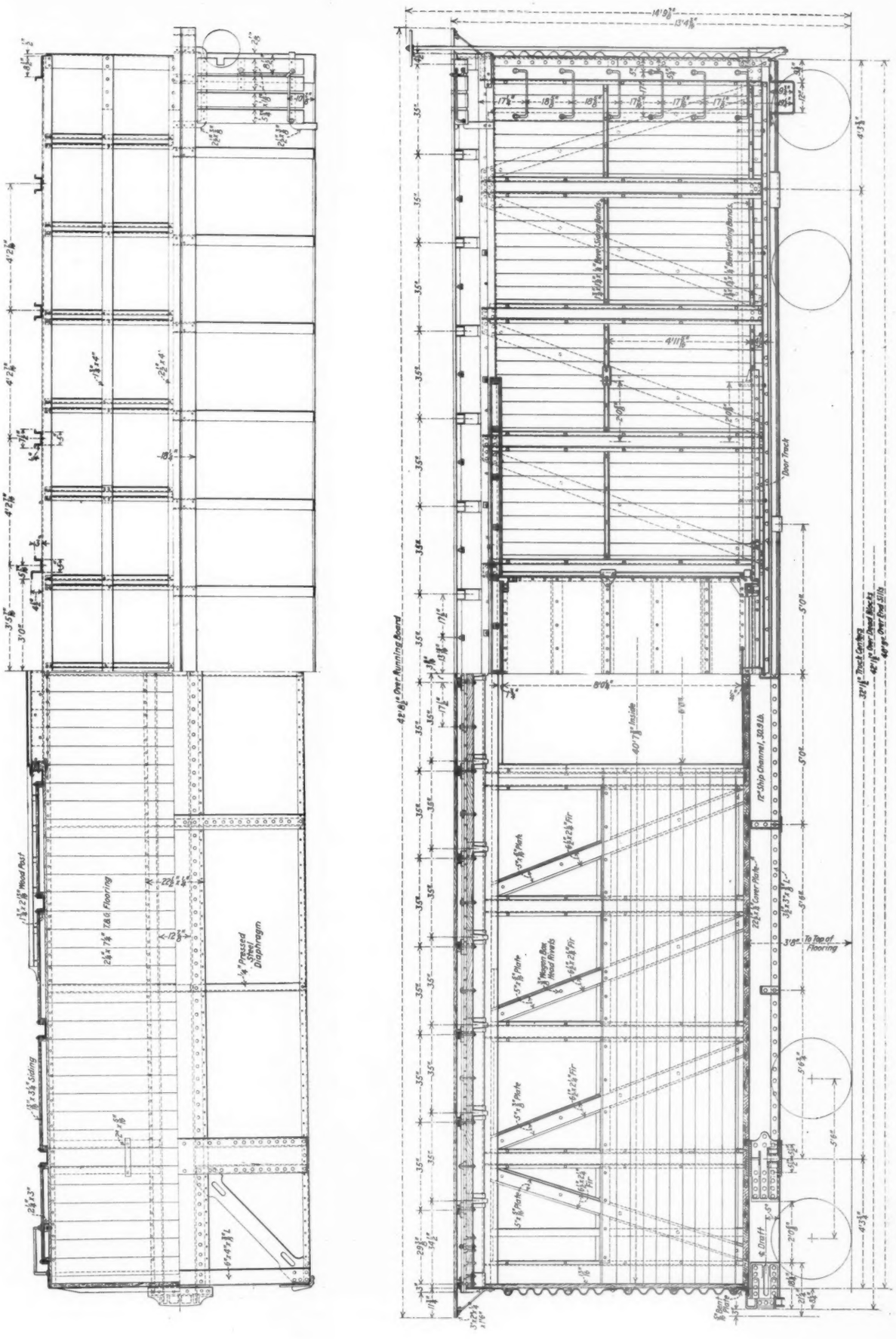
The body bolsters are of built-up design with cast steel center filler and rear draft lugs combined; the side diaphragms are of 5/16-in. steel plate spaced 7½ in. between webs and reinforced on top and bottom by 14 in. by ⅝ in. cover plates, and with ⅜-in. pressed steel stiffeners between the bolster webs at the side bearings. The body and truck center plates are either drop-forged or of cast steel riveted to the body bolster and truck bolster.

The main crossties are of built-up design, with single ¼-in. pressed diaphragms at the sides and between the center sills. Those of the general merchandise car are reinforced





General Arrangement of Steel Frame Furniture or Automobile Car for Atchison, Topeka & Santa Fe



General Arrangement of Steel Frame Box Car for Atchison, Topeka & Santa Fe

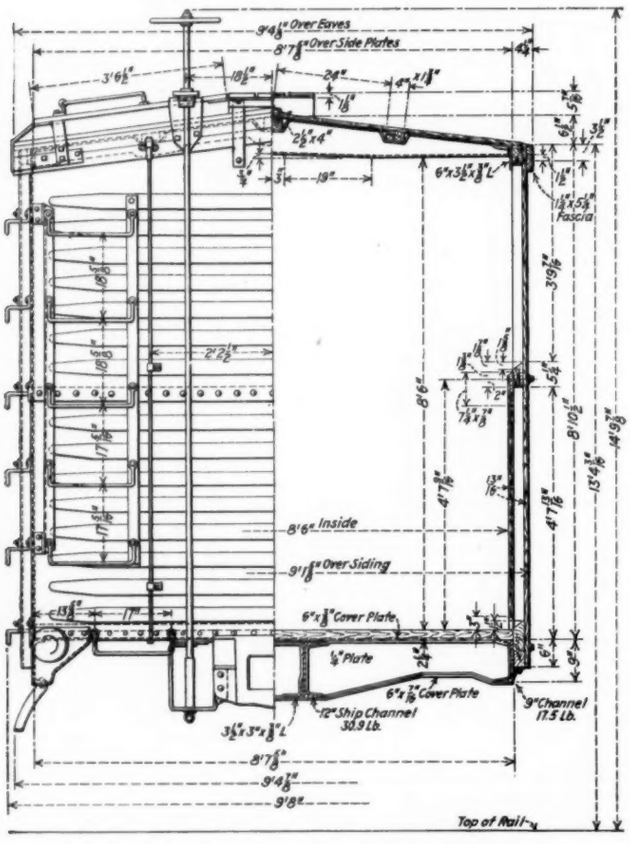
on top by 6-in. by 3/8-in. plate and on the bottom by 6-in. by 7/16-in. plate; those of the automobile cars are reinforced both top and bottom by 8-in. by 5/16-in. cover plates, and these cars are further strengthened at this point by diagonal bracing.

Body Framing

The body framing of both cars is of steel with wood stringers, post fillers, ridge pole, purlines, etc. All posts are cut perfectly square at the bottom ends so as to insure a good fit with the angle riveted to the outside of the side sill channel. To allow for fastening the siding, wood fillers are bolted under the flanges of the posts, and wood stringers, beveled on top, are fitted in between the post fillers and bolted to the side sill and to the supporting angles. Wood fillers are also placed at the tie plates.

There are 13 carlines of 5/32-in. steel plate, pressed to shape, with depressions for the ridgepole and purlines. The ridgepole is beveled on top to the pitch of the roof and riveted on each carline. The purlines are full length pieces, lap-spliced over and riveted to the carlines.

The construction of the body framing of the automobile cars differs only slightly from that of the general merchandise cars. The former have two belt rails instead of one and all posts are covered at the floor, lower belt rail, and between the upper belt rail and side plate with No. 26 galvanized steel. Similar covering is applied to the posts of the general merchandise car at the floor, the belt rail and between the belt rail and side plate. This is an important factor in making cars grain-tight around the posts.



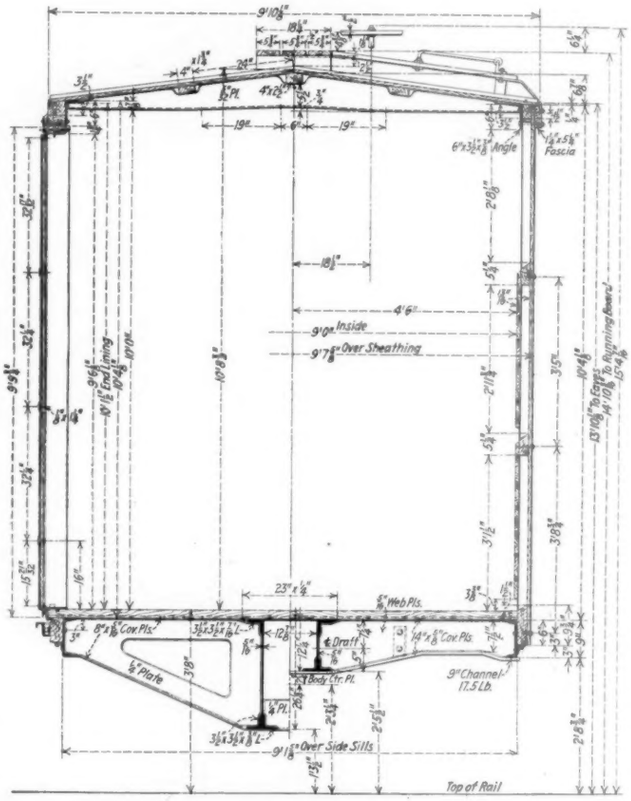
Cross Section of Santa Fe Steel Frame Box Car

End Construction

While both cars have similar types of end construction, they differ in some of the details; both cars are equipped with Murphy steel ends.

The end plates consist of 6 in. by 3½ in. by 5/16 in. open hearth steel angles, pressed to shape. The steel end of the general merchandise car is made in two pieces, of corrugated steel plate, the bottom piece being ¼-in. plate and the top piece 3/16-in. The plates are riveted together horizontally and the side edges are flanged to lap over the corner posts and the end is riveted to the side corner posts, to the end sill angle, and to the end plate.

The steel end of the automobile car is made in three pieces. Each piece is 3/16 in. thick and the riveted seams are horizontal. The end sill, the corner post, and the steel end are all welded together to close the opening at the top of the side sills.



Cross Section of Santa Fe Steel Frame Furniture or Automobile Car

The lining is tongued and grooved standard section, dressed on both sides, and runs in one piece from the door post to the end of the car.

The siding is V-face fir, dressed on both sides, and tongued and grooved. At each side post the siding boards fit tightly against the flange of the steel post and wood filler, and, after being properly tightened and nailed to the car, are further secured at the side sill and belt rail with open hearth steel straps ¼ in. thick, beveled on two edges.

The Roof

The roof boards are of 13/16 in. by 5¼ in. fir, dressed on both sides, tongued and grooved and applied crosswise of the car. All roof boards are gained on the top side for roof flashing and are sawed at the eaves and ridgepole on a bevel, parallel to the fascia.

The roofs of both classes of cars are Standard Railway Equipment Company's outside flexible metal roof, Type No. 2; the roof sheets, transverse cap, ridge cap and flashing, before galvanizing, are U. S. S. No. 24 gauge. The metal roof is secured to the ridgepole at the corners of the roof sheets by fir saddles and malleable iron center caps, and at

intermediate points by sheet anchors and malleable iron sheet anchor caps.

The eave flashing is nailed to the side fascia, and the end roof sheet and end of ridge cap are nailed to the end fascia. The eave flashing is also bolted, a galvanized iron cap being placed over the heads and soldered to the flashing.

All mullions are 1 in. by 2 in. and are nailed under the purlines, at the ridge pole, at side plates and through the roof boards.

The longitudinal running boards are of vertical grain fir 1⅛ in. by 5¾ in.; the total width is 18¼ in. The boards are surfaced on one side and two edges and secured to the saddles with flat-head wood screws. The latitudinal running boards, which are of the same grade and size of material as the longitudinal running boards, are held together and secured to the car by steel straps bolted to the car.

The side fascia is of 1¼ in. by 5¼ in. fir, at each side of door head and 1¼ in. by 3¼ in. under the door hood. The fascia is beveled on top to the pitch of roof, rabbeted at the lower outside edge and securely nailed to the car. The end fascia—1¼ in. by 5¼ in. fir—is shaped on top to pitch of roof and bolted to the end of car.

The Car Doors

The side doors are of unusually sturdy construction into which both wood and steel enter. Single doors are used on the general merchandise cars and double doors on the automobile cars, center door-stops being provided for the latter.

The door frames consist of Z-section, steel bars and the corners are mitered; the top corners have malleable iron gussets, which extend above the outside face of the Z-bar sections and are formed to extend over the horizontal projection of the door hood section. The part of the mitered Z-bar not covered directly by the gussets is welded. The bottom corners of the doors are connected by the door-roller housing casting.

The outside of the door is 1/16-in. open hearth steel; the inside consists of fir strips riveted to the 1/16-in. plate and Z-bars. The doors are of the bottom-hung type, rollers, housings and track being furnished by the Camel Company.

The door opening of the merchandise car is 6 ft. 0 in. wide by 8 ft. 0½ in. high; that of the automobile car is 10 ft. 0⅜ in. by 9 ft. 6⅛ in. clear with both doors open. With the smaller door closed, the opening is 6 ft. 0⅜ in. by 9 ft. 6⅛ in.

The door locking arrangement, door starter and door open fastener deserve mention. This device was designed by the railroad and consists of a malleable iron handle and arm which are fastened to the door, the arm being so designed as to engage a bracket fastened to the door posts. The method of engagement provides for closing and opening the door, and for locking or sealing it. The starting handle serves as the door hasp and is provided with two sealing positions, one with the door closed tight and the other with the door opened eight inches for ventilation.

The Trucks

The same design of truck is used under both types of cars. The principal features are Andrews cast steel side frames and cast steel bolsters with lateral motion caps cast integral with the bolster. The journals are 5 in. by 9 in. and the weight of a single truck is 7,740 lb.

Other Appliances

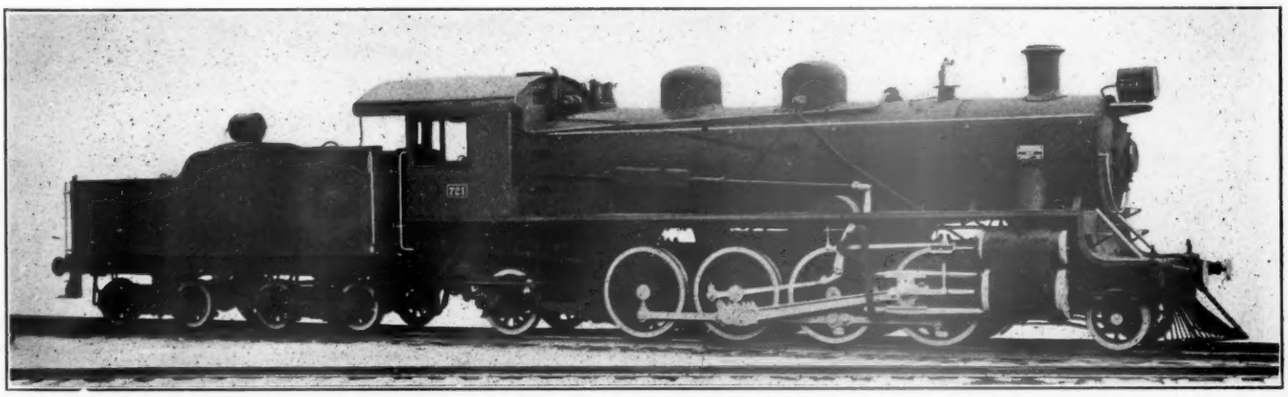
The deadblocks are of cast steel with the coupler carrier-iron cast integral with the deadblock and provided with a wearing plate for the coupler. The draft gear is Miner Friction Type A-18-S and the A. R. A. Standard, Type "D" coupler with 6 in. by 8 in. shank and 1⅝ in. by 6⅛ in. key slot, is used. The coupler yoke is cast steel.

The uncoupling device is the "Imperial" type. The brake rigging is the Westinghouse Schedule K. C. 1012 with K-2 triple valve, centrifugal dirt collector, 10-20 retaining valve, duplex spring loaded; "Creco" brake beams are used and all lever carrier irons, fulcrums, etc., are secured with rivets. The retaining valve is located on the end fascia. All piping for air brakes is of wrought iron and the trainpipe has a 10-in. nipple of extra heavy pipe at each end of car.

Each automobile car is equipped with 24 hoisting links. These are made from ⅝-in. diameter steel chain, welded into cast steel brackets, which are riveted to the inside face of the vertical flanges of the side plate angles.

Painting

Special provision for preventing the corrosion of metal parts has been made in the method of painting both types of cars. All parts coming in contact on trucks, underframe, and framing, which could not be painted after assembly, have been given a good coat of Lucas car roof cement before being put together. After assembly and before applying any of the wood superstructure, the entire underframe, posts, ties, steel ends and carlines were coated with the Lucas cement. A heavy coat of this same material was also applied to the top side of the outside metal roof, and the crack at the ends of the floor boards was sealed by applying the cement to the inside face of the side sill stringer, inside face of the posts for a height of 2¼ in., and to the top of the side sill flange. Wooden parts were painted all over before application and again after being placed in position. The entire trucks received two coats of carbon paint.



Mikado Locomotive Built by American Locomotive Company for the Chilean State Railways

Voting for Employees' Representative of Shop Crafts Association, Mt. Vernon Shop, Baltimore, Md.

Employee Representatives Elected on Pennsylvania

Eastern Region Polls Heavy Vote in the Shop Crafts and Clerks' Election

THE RAILROAD WORLD in general has followed the development of the employee representation scheme on the Pennsylvania Railroad with keen interest. Because of this and also because of the controversy between the Railroad Labor Board and the Pennsylvania Railroad over the election of employees' representatives for the shop crafts, the recent election in the Eastern region is of special interest. The election was held on May 21 and employee representatives were selected in the six shop crafts, and for the clerks and the miscellaneous forces in the operating department.

The following details of the election are taken from an article in the Pennsylvania News for the Eastern region:

"The elections in each of the three classifications of employees were conducted by secret ballot. In the case of the shop crafts, where the employees are more closely assembled, regular voting booths and ballot boxes were provided. Provision was made, however, for those unable to get to the polls to forward their ballots by United States mail.

"The clerks conducted their election by United States mail, while in the miscellaneous forces, the greater portion of the votes were cast in that manner. Voting booths were erected, however, where large numbers of these classes of employees are engaged. They were at such places as the New York, Philadelphia and Harrisburg districts.

Employees Ready to Vote in the Pennsylvania Shop Craft Election—Sunbury, Pa., Shops

"In the case of the shop crafts, there were 324 positions of local committeemen to be filled. For them there were 449 candidates in the field. The clerks' association presented the names of 80 nominees to fill the 29 offices, while the miscellaneous forces put up 41 candidates for the 27 vacancies.

"At the conclusion of the election, all the ballot boxes were sealed by the election board and sent by special messenger to the tellers of the election at Broad Street station. The ballots sent by mail were similarly addressed. Here the receptacles were opened and the ballots examined and counted by the tellers. These tellers on the employees' side were selected by them from among their own ranks, and an equal number selected by the management.

Shopmen Cast Heavy Vote

"The six classifications of shop crafts each chose three committeemen from the blacksmiths, machinists, boilermakers, electrical workers, sheet metal workers, and carmen and car cleaners. There were 21,421 votes cast in the Eastern region from a total of 24,435 employees who were eligible to vote. This represented an 87.7 per cent vote. Comparatively few of the ballots had to be thrown out under the rules adopted for conducting the election.

"Theodore H. Davis, general chairman of the Eastern region shop crafts employees in commenting on the election, said:

" 'The shopmen of the Eastern region are to be congratulated on the splendid manner in which they participated in the election. It proves conclusively the popularity of the present plan of dealing directly with the management in matters affecting our own welfare.

" 'The future is dependent upon the energy which each member of the shop crafts will inject into the movement. By putting shoulder to shoulder, it is bound to show to the railroadmen of the country that the Pennsylvania Railroad shopmen are well able to conduct their own affairs.'

Dates for Selecting Chairmen

"The local shop crafts committeemen organized on their respective divisions on June 4 and selected the divisional chairmen. June 19 is the date for the divisional chairmen to meet in convention for the purpose of selecting a general chairman for the Eastern region as well as craft general chairmen. These persons will then constitute the regional committee which will deal with representatives of the management in all shop craft matters in the region.

"The election returns for the clerks of the operating department show that out of a total of 9,641 eligibles, 7,756 voted, or 80.4 per cent.

"The miscellaneous forces of the operating department cast a 75.8 per cent vote. The total number of employees who were eligible was 6,439. There were 4,879 votes cast.

"Generally speaking, practically the same procedure will be followed by these two classifications of employees in the selection of general and regional committeemen as that adopted by the shop crafts employees.

"Certificates of election will be issued to the committeemen-elect. Notices will be placed on all employees' bulletin boards containing the complete roster of those who will serve in the various positions for the terms prescribed on the ballot in conformity with the agreements entered into jointly with the management when the plan of employee representation was inaugurated."

Elections were also held in the Central Region and at the Altoona works. In the Central Region 79.2 per cent of the total number eligible voted in the shop crafts election and 74.2 per cent in the election of the clerical forces. At the Altoona works more than 90 per cent of those eligible voted.

Organized Co-operation on the Railroads

"Organizations of Employees * * * Can Make a Positive Contribution of Tremendous Value."

By William H. Johnston
President, International Association of Machinists

A WISE RAILROAD MAN remarked recently that one of the principal troubles of the railroads is poor morale of the working forces. There is urgent need for improvement of efficiency, for getting the utmost possible out of the dollar spent.

In this connection there is an important fact just beginning to be recognized by a few executives—that just as the organizations of employees can injure the railroads when forced to withdraw their co-operation, so they can make a positive contribution of tremendous value when their co-operation is enlisted.

The injury caused by withdrawal of co-operation can be plainly seen on all roads in the financial and operating statistics for the period of July 1 to September 15, 1922, when the shop strike was nationally effective. The superior results of co-operation, even of the most elementary kind, can be traced by comparing the subsequent performance of prominent roads which settled with the Federated Shop Crafts in September with the performance of others which did not.

It is not my purpose here to discuss these controversial matters in detail; any candid expert who cares to examine the official statistics may discover the truth for himself. I do wish to point out what co-operation consists in, however, and why the unions are capable of exercising it to a degree hitherto undreamed.

Development of Unions

In its primitive stages a union of workmen is a spontaneous organization for mutual self protection. It naturally begins by laying emphasis on those views and wishes of the employees which the management is least ready to understand or to act upon. In the early stages, the management is apt to regard the union as a hostile force, one to be resisted in every way at all costs. Controversies arise about wages, hours, working rules, etc., in which the men find the management against them and the union their chief protection and advocate.

In such controversies the union is *their* organization, and enlists their co-operative loyalty; while the management seems, to the men, a hostile force.

A little later the management may see that to destroy unions is impossible in the long run, and the attempt to do so is ruinous of morale and efficiency. It may thereupon proceed to tolerate the union as a necessary evil, but one still to be looked on with suspicion and opposition. This is the state of relations between many railroad unions and man-

agements today, and while it is better than relentless warfare, it is a negative and undesirable condition.

Possibilities of Unions

Suppose, however, a management looks further ahead and adopts a little broader point of view. The men's own organizations are a valuable asset to the railroad, because through them the management may discover more quickly and easily conditions which are troubling the men. Conditions will be discovered which have to be removed in order that employees may be satisfied and prepared to give their best to the industry. The management's view of the proper remedies may differ from the view of the men's representatives. But once the management sees the desirability of remedying such conditions, and is willing to confer about them with genuinely voluntary organizations which enlist the men's spontaneous loyalty, adjustments may be made and remedies devised in the light of reason. The independent advice and consent of the men in such matters cannot be dispensed with.

The most important thing about such a relationship is that it lays the basis of confidence on which constructive plans may be laid. A skilled workman is more than a thing to be bought and sold in the market, or a seller of hours of work for as much wages as he can get. He is more than a machine to be driven. He is a human force in industry, interested in its processes and results, capable of making a positive contribution. If his conditions of work are pleasant, if he is conscious that the management is treating him fairly, he can make contributions to efficiency which cannot be worked out without his co-operation.

There is no way in which to convince the workman that the management is solicitous of his interest, and is willing to play fair with him, so good as a friendly relationship with his union. Once the fundamental grievances and suspicions are cleared out of the way, once the workman is convinced that he can command justice and is going to receive a fair share of what he contributes, he is ready to co-operate.

Co-operation Must Be Organized

But co-operation must be organized. Management cannot secure tangible co-operation from a formless mass of thousands of individuals whose relationship to one another is unco-ordinated. It cannot secure co-operation from a "company union" whose very existence depends, when a crucial test may come in a controversial matter, upon the management. Co-operation must be organized through a genuine association which enlists the spontaneous loyalty of the men and, because it has the power to bargain, also has the power to execute responsibilities. There must be representatives of the men, meeting management on terms of equality, who are able to arrive at a definition of co-operation, who are able to agree for the men just what they will do for their part in improving production, and who, because they truly and freely represent the men, are able to see that such agreements are carried out.

Lax conditions and wasteful practices cannot be properly attacked unless the men and the management both have a measure of economic security in their relations with each other. Just as public law and the rights of property safeguard the security of the interests which management represents, so standards and customs, the honest enforcement of which the unions are able to maintain by the power of their organizations, tend to safeguard the economic security of the workers. Efficiency can be increased only by relating it to such explicit and stabilized conditions of work. Standards of efficiency must, in the nature of the case, be accompanied by standards of economic security for the wage-earners. Co-operation, in short, must be built solidly on genuine organization and genuine mutual understanding and respect. Experience has demonstrated again and again that understanding and respect become genuine and lasting only when each party clearly appreciates the power and ability of the other. When such a basis has been laid, and a willingness to co-operate exists on both sides, the union machinery becomes available to help carry out beneficial policies mutually agreed upon.

Organized Labor's Attitude Toward Efficiency

These policies may have to do with reducing production cost, with the more efficient utilization of time, materials and plants. There is an impression that efficiency injures the men, or that unions oppose efficiency. This is profoundly untrue. Methods thought to be efficient, which do work against the interests of the men, are not efficient in the long run. Truly efficient methods will not work if built on dissatisfaction and suspicion. But there are immense possibilities of increasing true efficiency which works to the benefit of all concerned. Unions and managements in co-operation may, with proper technical advice, discover and apply more efficient methods in a way that would be impossible for management acting alone.

The welfare of the railroads—investors, managements and employees—ultimately depends on their service to the public. The better that service can be made, and the more efficiently good service can be rendered, the better everyone engaged in the industry may fare.

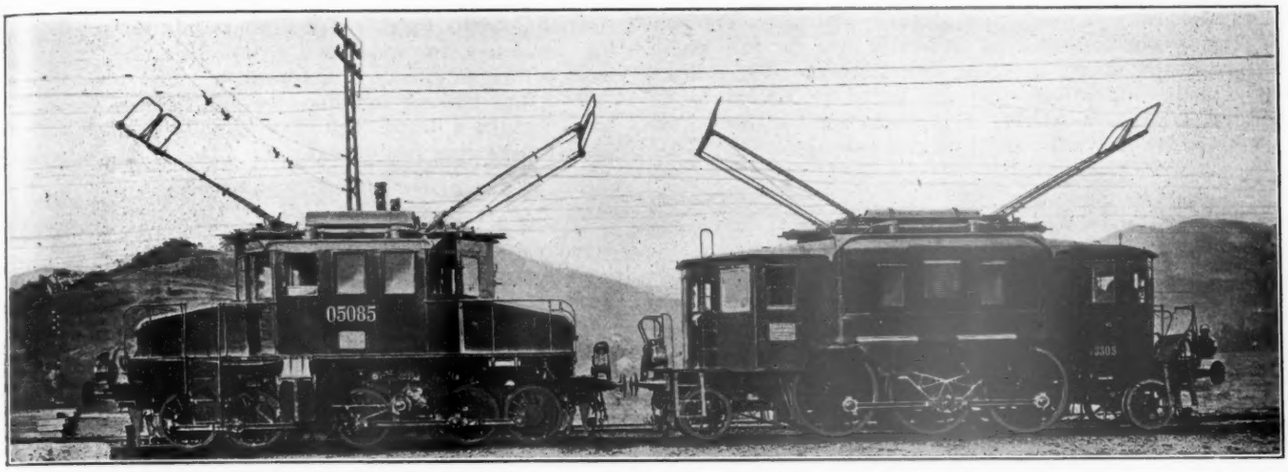
As long as employees are convinced that a railroad is being operated in the narrow, selfish interests of investors or other private groups, they have no incentive to co-operate. As long as employees believe that they will suffer from the introduction of efficiency, and that its benefits will go solely to owners and managers, they are bound to oppose and nullify new methods—if not by organization, then by individual reluctance. But if they are convinced that the railroads are trying to serve the public, and that employees will receive their fair share of the benefits from improved methods, the men's attitude will be constructive.

One Railroad Experimenting

The railway unions have been much criticized by managements for advocating nationalization of the roads. Managements should understand that this attitude does not arise from "original sin" or from "Russian gold." It is an expression of the natural feeling noted in the above paragraph. If the railroads can produce as good service and deal as justly with employees under private control as they could under the public, the organized railroad workers will be satisfied with private control. What they want is not the form, but the substance. It is the privilege of managements to co-operate with the organized employees to further the creation of a soundly and justly operated railroad system. Such organized co-operation is now being attempted on one important railroad, and it is hoped that others may follow the example.

The policy of the standard railroad unions representing the shop crafts is now to encourage organized co-operation as outlined above. If managements will see the benefits to be obtained in this way, and will also in good faith adopt the policy, 90 per cent of the labor troubles on the railroads will disappear.

CHARLES USELIS, charged with murder in wrecking a Michigan Central express train at Gary, Ind., on August 20, 1922, during the shopmen's strike, was acquitted by a jury in the Lake county court at Crown Point, Ind., on June 7. The accused was arrested on August 29 and signed a confession that he was implicated in the derailment, which was caused by the pulling of 27 or more spikes. At the first trial last February, the jury was unable to reach a verdict. At the second trial, just concluded, after 15 days, the jury reached its decision in 30 hours.



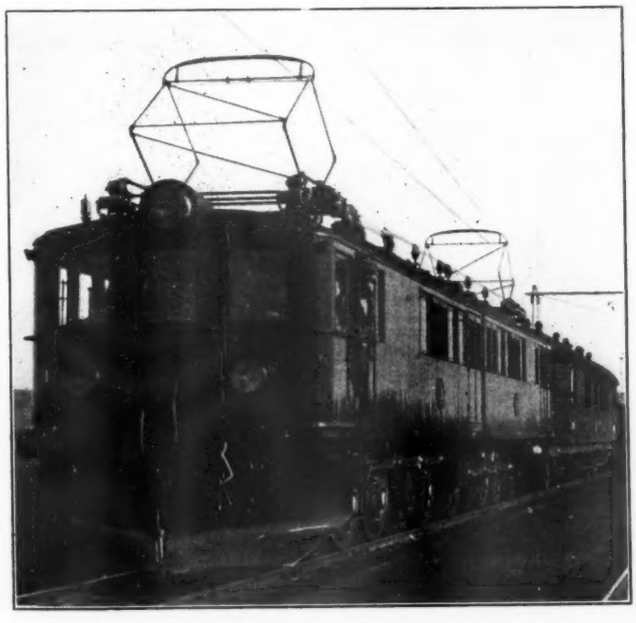
Italian Westinghouse Electric Locomotives Showing Rod Drive.

Some Details of European Electric Locomotives

Clearances and Other Physical Limitations Greatly Affect the Design of Foreign Motive Power

By H. A. Kjelsberg
Railway Equipment Engineer, Westinghouse Electric & Mfg. Company

For steam locomotives certain standards established during a long period of development apply practically all over the world. Not so for electric locomotives. The time for the development of this type of locomotive has been relatively short. There is also a great diversity in possible designs and arrangements. It is questionable if there will ever be such uniformity in design for electric locomotives as we have now for steam locomotives.



Swedish Locomotive Showing Geared Rod Drive

In a general way, one can divide electric locomotive mechanical designs into three classes. The first class is a further development of the electric street car (locomotives with axle-mounted motors), the second one is based on steam locomotive practice (rod drive), and the third one comprises all designs especially developed for electric locomotives (Westinghouse quill drive, Brown Boveri drive and others).

The second of these classes is most common in Europe and the third one is being developed there at the present time, while the first class, which is frequent in American practice, is scarce in Europe. This difference between European and American practice is due in the first place to the divergence of opinion among engineers, regarding the relative importance of the requirements to be met by the locomotives and, in the second place, to the difference in labor and operating conditions. A mechanical design is always a compromise between contradictory and conflicting requirements and this is especially true for electric locomotives.

The maximum axle load and the clearance diagram are probably the factors which have the greatest influence on the design of a locomotive and here is where the European engineer is much more limited than the American. In most countries the maximum axle load is only about half that permissible in the United States and the clearance diagrams are much smaller. For these reasons, the European engineer must be much more careful with weights and space than the American. The tendency to build every part as light as safety permits and as compact as possible can be seen in all European locomotives.

The space for this article is too limited to discuss all mechanical parts in detail, but the leading principles governing the design will be given in the following paragraphs.

Frames

Plate frames are used nearly exclusively in Europe for electric locomotives. Bar frames are not favored on account of their higher weight, less assurance of good material and the presence of secondary stresses, which may be dangerous

and are always difficult to evaluate. The plates are reinforced by angles riveted on, generally over the full length. Crossties are mostly box type steel castings. The pedestal jaws are steel castings and are bolted or riveted to the frame. To save weight, the plates are cut out. The bumpers are either structural or steel castings.

Brakes

Both air brakes and vacuum brakes are used in Europe. There is generally an arrangement that the brake on the locomotive can be released separately while going down grade, so that only the train is braked. This is done to save locomotive tires and because in some countries the law requires that the couplings of the cars be always stretched and forbids holding the train with the locomotive alone. This law makes regenerative braking by train weight in these countries impossible. If possible there are two brake shoes per wheel to avoid one-sided pressure on the journals. and pedestals.

Drive

Most European electric locomotives have rod drive, either direct or in connection with gears, both types with or without jackshaft. It would be too far reaching to describe the fifty or more different arrangements of rod drive that are in use; therefore only general characteristic will be given.

Direct drive is accomplished through scotch yokes, inclined rods or vertical rods. This drive requires large slow speed motors, but has the advantage that the motors are generally readily accessible.

Geared rod drive gives lighter motors, but the total difference in weight between a small motor with gear and a heavy slow speed motor without gears is generally inconsiderable. The experiences with both types of rod drive must have been generally satisfactory, because most of the railroads retain the once adopted type. Considerable troubles were experienced in the beginning with critical speeds, but since flexible gears and pinions are used the destructive consequences of vibrations have been practically eliminated.

It must be added in this connection, that European locomotives are generally very well maintained. The bearing clearances are kept within close limits and the center distances of the crank pin bearings are carefully adjusted. The magnitude of the vibrations at critical speed is a function of the clearances in the bearings and the accuracy of the center distances. If, by a correct flexibility in the gear or pinion, the critical speed is brought down to a low value where the inertia forces are small and at the same time bearing clearances are small and center distances, exact then there will be no difficulty on account of vibrations. In some cases it was possible to reduce the vibrations at the critical speed to such a degree, that they could be detected only by special measuring instruments.

Equalization

Three- and sometimes four-point suspension is used with single truck and articulated locomotives. Four-point suspension is possible because the track in Europe is generally smoother than it is in the United States. Side equalized trucks with the cab weight applied at two points, to get a balancing moment, are not used. In articulated locomotives the cab rests generally on two spherical center pins, one of them rigid and the other longitudinally movable, but laterally restricted. On account of the greater weight of the American locomotives it is very often impossible to support the cab at only one point per truck and therefore side equalization is necessary.

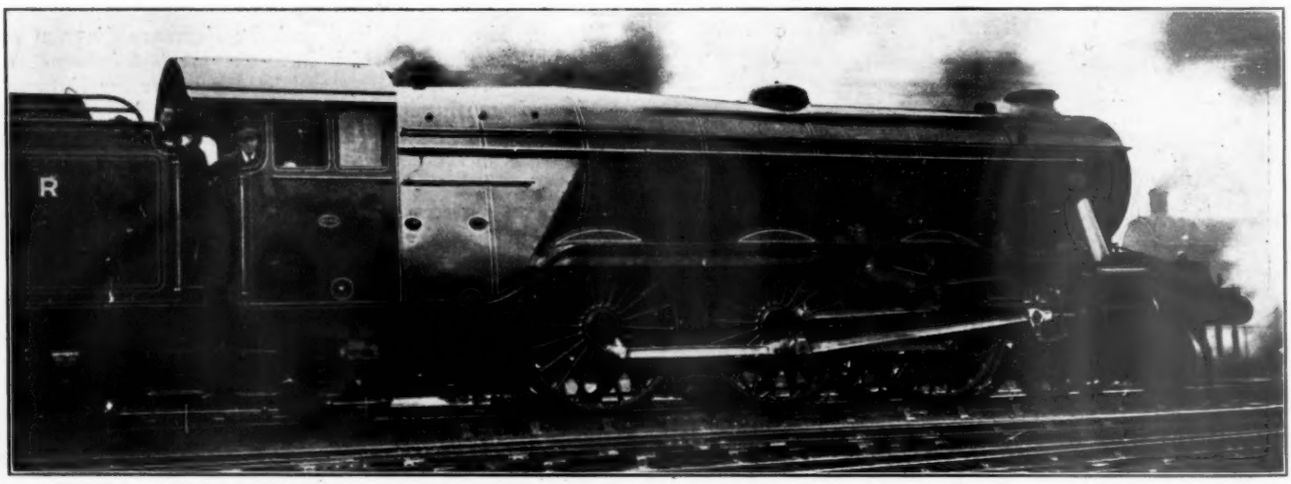
The spring hangers are in most cases adjustable to avoid shimming. Semi-elliptic springs are used but, in two- and four-wheel trucks, helical springs are often used in connection with semi-elliptic ones. All wearing parts in the equalization system are generally case-hardened.

General Features

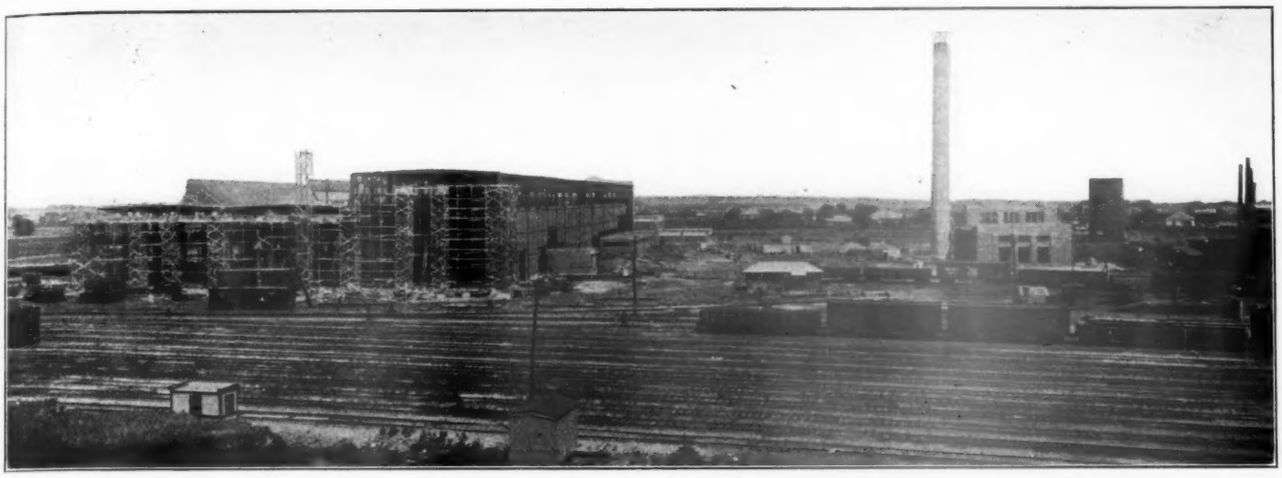
In European designs of electric locomotives there is a tendency to raise the center of gravity to obtain better riding qualities and to reduce the vertical and lateral impact on the rails. For the same reason the dead weights are reduced. To make the entering of curves easier and to reduce flange wear the moment of inertia around the vertical axis should be as small as possible. This is accomplished by concentrating the heavy masses in the neighborhood of the vertical axis through the center of gravity.

Conclusions

In American locomotive design simplicity and easy maintenance become dominating factors under the pressure of the present labor conditions. In Europe where skilled labor is cheaper one is willing to sacrifice simplicity to get locomotives which are mechanically more perfect. The limitations in weight and less severe operating conditions exert an influence in the same direction. It can therefore be easily understood why the somewhat complicated rod drive has been preferred in Europe.



A Trim British Locomotive, Highly Finished in Green—A London & North Eastern Pacific, Built at Its Doncaster Works



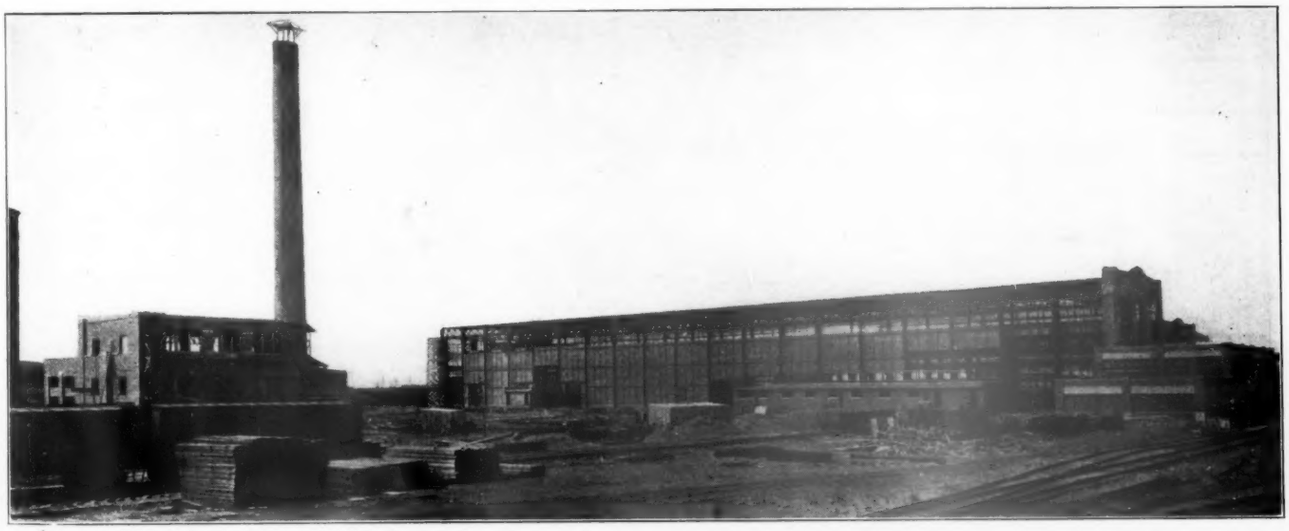
West Elevation of the Shop Building During Construction

Repair Shop Has All Facilities Under One Roof

New "Katy" Plant Accommodates Erecting, Machine Tools, Boiler and Tank Work and Stores in One Building

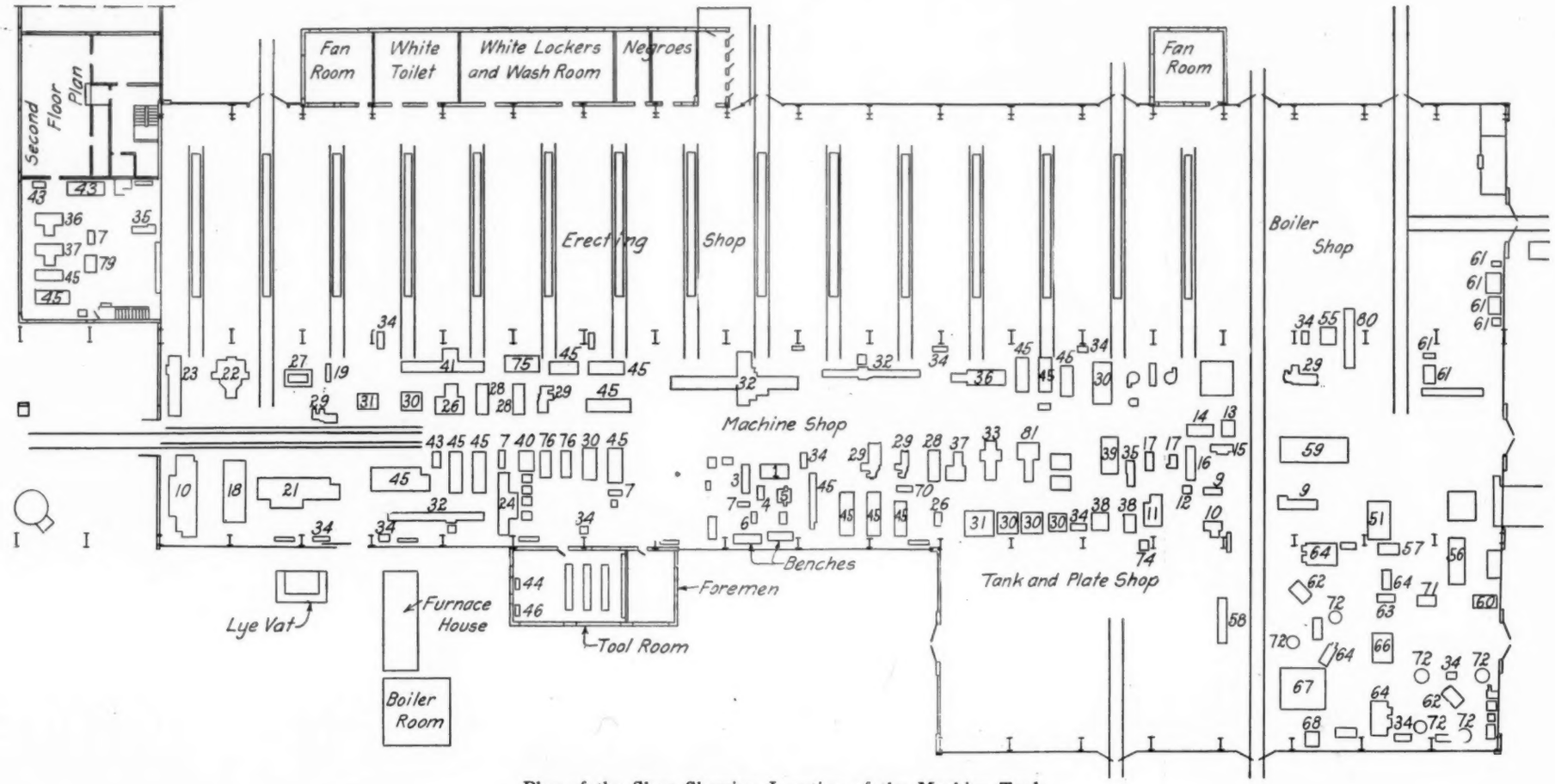
THE COMPREHENSIVE PROGRAM for the improvement of facilities for the handling and repairing of locomotives which has been carried out on the Missouri-Kansas-Texas, under the receivership recently terminated, includes the construction of a locomotive repair shop at Bellmead terminal, Waco, Tex., at a cost of about $1,700,000, which is designed for the conduct of all classes of heavy locomotive repairs. In addition to the large repair shop building, which is of particular interest because it houses all the necessary facilities for the conduct of locomotive and boiler repairs under one roof, the improvement includes a number of auxiliary facilities, of which the most important is a large modern power house. The new facilities have been designed to fit into the existing layout at Bellmead, making such rearrangements as were found necessary, including certain changes in track locations. It was necessary, however, to make some additions to the land area devoted to terminal purposes at this point.

The present construction is planned for heavy repairs to 16 to 20 locomotives per month and, while the shop is designed primarily with a view to economical operation under present conditions, consideration was also being given to its adaptation to a plan for future development with a minimum expense for rearranging buildings and tracks.



The New Shop as Seen from the Southeast, Stores Wing on the Right, Power House at the Left

The main portion of the shop building is 475 ft. long by 151 ft. wide, measured inside the walls, and is subdivided into 19 transverse bays 25 ft. wide, and 2 aisles or longitudinal bays, 80 ft. and 71 ft. wide respectively. A second aisle 71 ft. wide forms a wing for a length of 8 bays or 200 ft. along the north side of the building at the west end, while at the east end of the building is another wing, 152 ft. by 50 ft. projecting south from the south side of the building for a



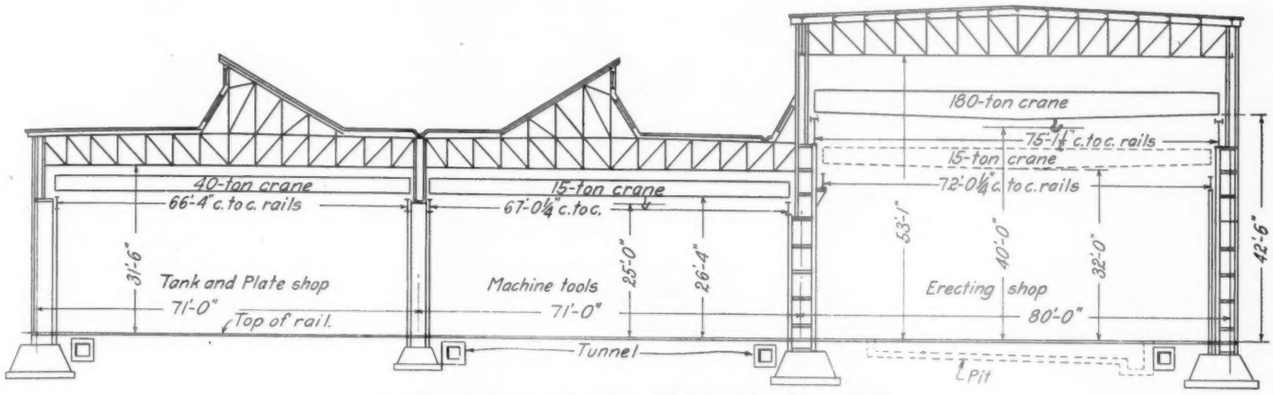
Plan of the Shop Showing Location of the Machine Tools

LIST OF MACHINE TOOLS

Item No.	Description.
1.	Armature Machine.
2.	Armature Coil Winder and Spreader.
3.	Armature Coil Taping Machine.
4.	Magnet Wire Reel Rack.
5.	Insulation Shear.
6.	Armature Stand.
7.	Upright Sensitive Drills.
8.	Double Emery Grinder.
9.	Band Saw.
10.	Rip Saw.
11.	Cut-off Saw.
12.	Grindstone.
13.	Plate Shears.
14.	Cornice Break.
15.	Splitting Shear.
16.	Tinners' Roll.
17.	Pipe Threading Machine.
18.	Driving Wheel Quartering Machine.
19.	Driving Box Press.
20.	Journal Turning Lathe.
21.	Car Wheel Lathe.
22.	Turning and Boring Mill.
23.	Driving Wheel Press.
24.	Piston Rod Grinder.
25.	Hydraulic Press.
26.	Milling Machine.
27.	Draw-Cut Shaper.
28.	Crank Shaper.
29.	Plain Radial Drill.
30.	Vertical Turret Lathe.
31.	Vertical Boring and Turning Mill.
32.	Planer.
33.	Slotting Machine.
34.	Grinding Machine.
35.	High Speed Hack Saws.
36.	Drilling and Milling Machine.
37.	Crank Planer.
38.	Bolt Cutter.
39.	Rotary Cut-off Saw.
40.	Drilling Machine.
41.	Guide Bar Grinder.
42.	Rod Boring Machine.
43.	Grinder.
44.	Drill Grinder.
45.	Engine Lathe.
46.	Tool Grinder and Shaper.
47.	Blacksmith's Anvil.
48.	Electric Tool Hardening Furnace.
49.	Electric Oil Tempering Bath.
50.	Gas-Fired Oven Furnace.
51.	Multiple Drilling Machine.
52.	Staybolt Threading Machine.
53.	Annealing Furnace.
54.	Air Brake Testing Rack.
55.	Upright Drill.
56.	Flange Clamp.
57.	Rotary Bevel Shear.
58.	Punch and Shear.
59.	Plate Bending Rolls.
60.	Pneumatic Flanging Machine.
61.	Flue Shop Equipment.
62.	Steam Hammer.
63.	Bradley Hammer.
64.	Oil Furnace.
65.	Bar Shear.
66.	Bull Dozer.
67.	Forging Machine.
68.	Forge Blower.
69.	Libby Lathe.
70.	Bolt Centering Machine.
71.	Horizontal Punch.
72.	Forge Blower.
73.	Electric Rivet Heater.
74.	Die Grinder.
75.	Link Grinder.
76.	Fox Lathe.
77.	Turret Lathe.
78.	Clamp Press.
79.	High Speed Drill.
80.	Double Punch.
81.	Slotter.
82.	Locomotive Wheel Lathe.

distance of 74 ft. 2¼ in. Also along the south side of the building are two smaller wings, one 25 ft. by 150 ft. and the other 25 ft. square, while another small wing, 27 ft. by 58 ft. 8 in. projects from the north side of the building.

The 80-ft. aisle in the main body of the building comprises the erecting shop, while the 71-ft. aisle serves as the machine tool shop. However, the first four bays of these two aisles at the west end of the building, covering an area 100 ft. by 151 ft., will be utilized as a boiler shop while the remaining

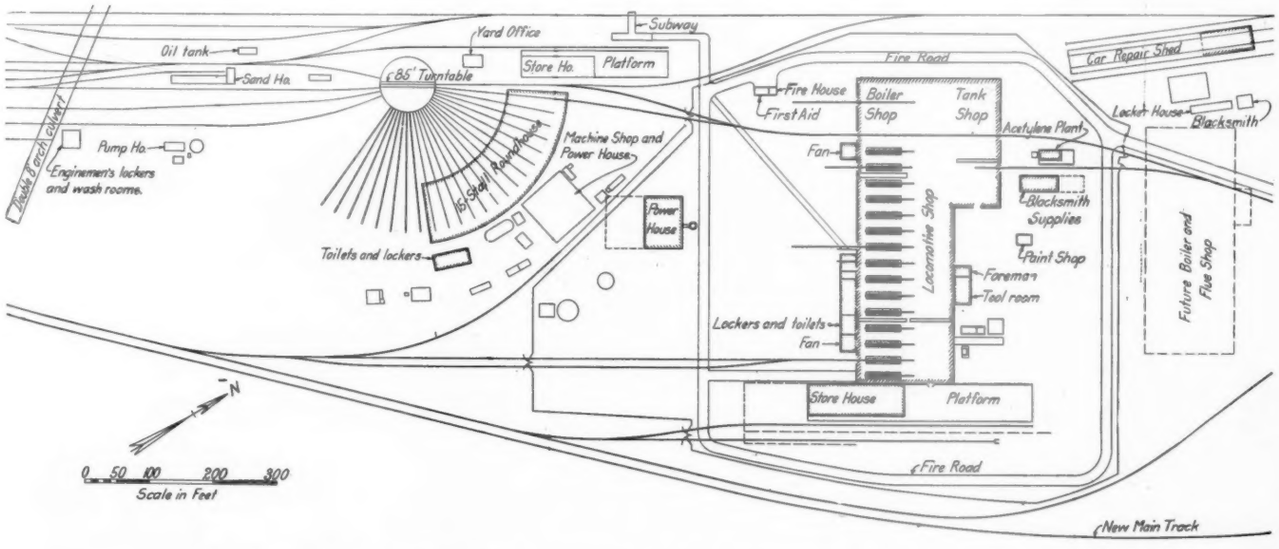


Cross Section of the Shop Building Looking East

375 ft. of these two aisles will serve as the locomotive shop. The large wing projecting from the north side of the building will be the tank and plate shop. The east bay, which is a two-story structure, will house the stores department on the lower floor, and the shop office and manufacturing toolroom on the second floor. The two small one-story bays along the south end of the building will house locker and toilet rooms for white and colored employees and two fan rooms, while the small wing on the north side of the building will be used as a distributing toolroom and foreman's office.

The building is of steel frame construction throughout with the major portion conforming to the prevailing standards of industrial building construction. The erecting aisle has a clear height of 53 ft. 1 in. to under-clearance of the roof trusses which are supported on columns conforming to the 25 ft. transverse bay arrangement and designed to support the roof trusses and two crane runways, the upper one for a 180-ton crane to handle locomotives and the lower one for a 15-ton crane to be used in handling lighter parts. As it is believed that the 180-ton crane can readily handle all movements of locomotives to and from the various pit tracks, it has been deemed unnecessary to provide a transfer table. Each of the 15 bays in that portion of the erecting aisle to be used for the locomotive erecting shop is to be equipped with a track and track pit, each track extending a distance of eight feet into the machine tool aisle.

The two 71 ft. aisles are of duplicate construction except that the one used for the tank and plate shop does not extend the full length of the building. The underside of the roof trusses in these two aisles is 35 ft. 7 in. above the floor, and each is equipped with a crane runway with top of rail 26 ft. 4 in. above the floor. The crane in the machinery aisle is to be of 15 tons capacity, while that in the tank and plate shop aisle is of 40 tons capacity. The roof trusses in each case are of rectangular outline except that a single saw tooth is superimposed on each with its top extending to a height of 16 ft. above the general level of the roof and providing a window area having a vertical height of about 12 ft.



Map of the Facilities at Bellmead Terminal. New Structures Indicated by Heavy Lines

An interesting detail in connection with the efficient operation of the machine shop is to be found in the extension of the crane runway for the machine tool shop for a distance of 75 ft. beyond the east end of the building, or over a casting platform and the tracks adjoining it so that the crane can be used for unloading castings or in transporting them from cars or the platform to any of the machine tools in the shop.

The shop floor is of reinforced concrete, with a mastic surface, while the roof consists of cement tile, covered with composition roofing. The walls of the building are almost entirely glass. Along the two sides of the main shop structure, the glass extends for the full width between the faces of columns which are exposed at the outside of the building. The two ends of the shop are also largely of glass, except that ornamental treatment is provided in the form of brick pilasters, and brick facing in the plane of the trusses. The brick work is ornamented with concrete belt courses and copings. The glass areas in the smaller wings and in the portion of the building used by the store department and the manufacturing tool room is also large but with considerable area in brick pilasters and concrete trim. All glass throughout the entire building is set in steel sash.

The building is heated throughout by a forced draft hot air system from the two fan rooms mentioned above where air driven through steam coil heating units is transmitted through concrete ducts under the floor to outlets distributed throughout the building.

The brick and steel power house is located between the shop and roundhouse. The present construction is designed for the use of oil as fuel, with provision for the installation of coal and ash handling facilities when required. The reinforced concrete chimney is 8 ft. in diameter and 177 ft. high. The power installation includes 328 hp. water tube boilers and appurtenances, two air compressors of 2,000 and 500 cu. ft. capacity, and duplicate fire pumps.

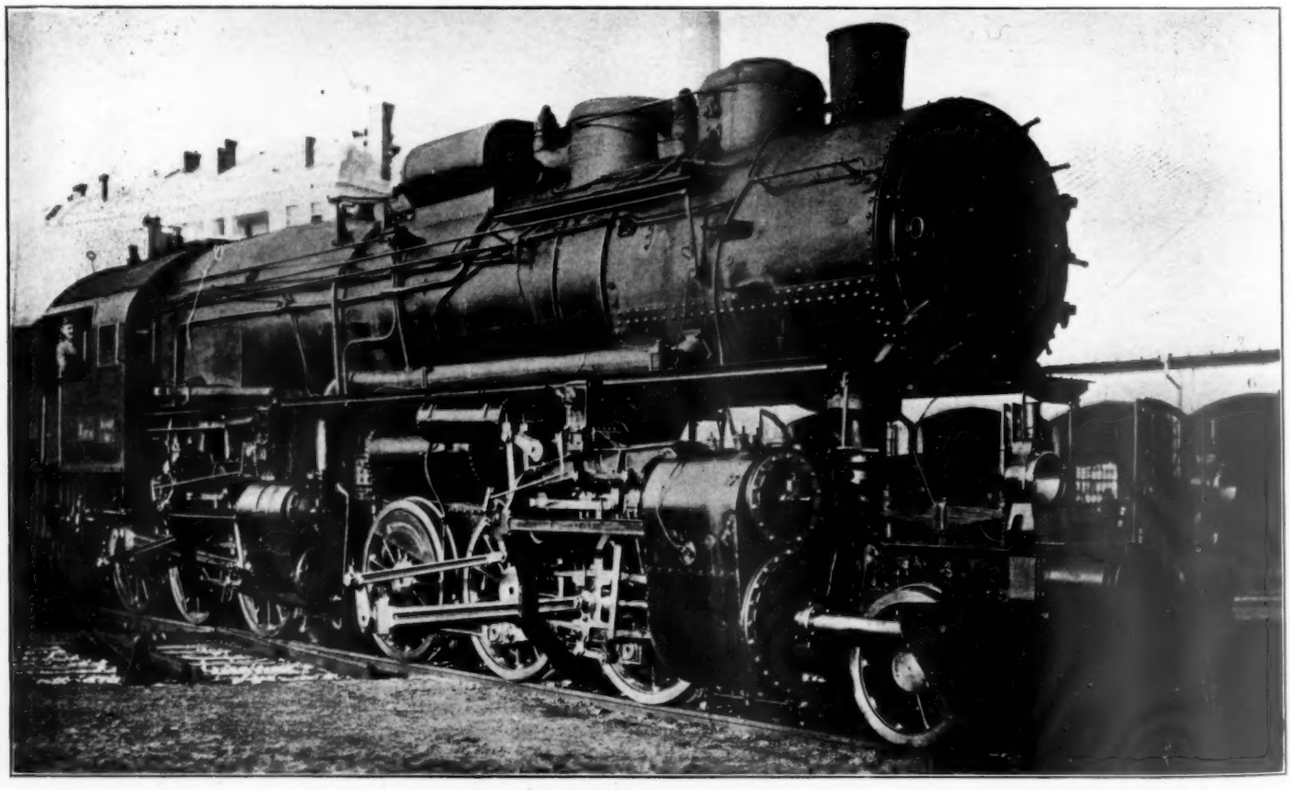
The shop is completely equipped with new machinery, driven by electric power with individual motors. The circuits are generally carried in conduits under the floor. A circuit with self-registering apparatus is provided for checking machine performances. Electric power is furnished from the Waco generating station of the Texas Power and Light Company.

Among minor outbuildings are a supply building for the blacksmith and boiler shops, a paint shop, an oxy-acetylene plant, a first-aid room, and a fire engine and hose house. The work under way also includes a brick lavatory and locker building for roundhouse employees. A concrete foot subway 8 ft. by 8 ft., 355 ft. long has been constructed under the yard to provide convenient passage between the shops and streets west of the terminal.

The preparation of the site involved 140,000 cu. yd. of grading and the relocation of a mile of main track. The work includes about 3,300 cu. yd. of reinforced concrete in culverts, subway and foundations and 2,000 tons of structural steel in the building.

Grading and concrete work, including foundations and pits for the shop building, was done by the J. E. Hutt Contracting Company, Kansas City, Mo.; the Mt. Vernon Bridge Company furnished and erected the structural steel; the Beckett Electric Company, Dallas, Texas, made the electric power installation; and H. D. McCoy of Cleburne, Texas, is general contractor for the buildings. The design and construction is being carried out under the direction of F. Ringer, chief engineer, Missouri-Kansas-Texas, St. Louis, Mo., assisted by J. M. Metcalf, principal assistant engineer, A. L. Sparks, architect and M. C. M. Hatch, mechanical engineer. E. W. Metcalf is engineer in charge at Waco.

THE CHICAGO, ROCK ISLAND & PACIFIC has issued an attractive 30-page booklet entitled "On Your Way to California," which describes the route of the Golden State Limited. The first part of the book is devoted to a description of the equipment and the route in general with relation to eastern connections and stop-over privileges. The latter part of the book contains a detailed description of places of interest along the route, dealing with points of historical interest, scenery, industrial interest and places of recreation.



A Hungarian Mallet

Transverse Forces in Truck Side Frames on Curves

An Analysis for Determining the Stresses Set Up by Wheel Slippage, Coupler Pull and Elevation of Rail

By G. A. Anderson
Research Engineer, The T. H. Symington Company

IT IS A GENERALLY recognized fact that truck operation on a curve is attended by stresses in the truck structure not attending its operation on a straight track. An estimate of the loading which induces these stresses is needed as one of the basic points on which to base intelligent truck design. The purpose of this analysis is to furnish such an estimate, giving also briefly the reasoning processes upon which it rests. For the present, the effect of coupler pull, super-elevation of rail, and centrifugal force are not considered.

The conventional car truck is so organized that if pushed over a plain horizontal surface it describes a straight line path. It can be made to deviate from this path only by lateral forces properly applied. When the truck enters a curve, it therefore proceeds along a straight line until the flange of the outer leading wheel contacts with the outer rail head. After this contact is established a continued progress compels this wheel to follow the rail curve.

Positions of Trucks Traversing a Curve

Fig. 1 shows the relative position of truck and track as this contact is first effected. The arrow indicates the direction of movement of the truck along the track; W_1 denotes the leading outer wheel; W_2 the trailing inner wheel. The

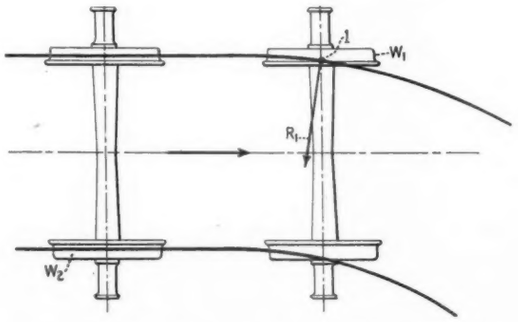


Fig. 1—Position of Truck Entering a Curve

numeral 1 indicates the above mentioned point of contact between the flange of the wheel W_1 and the rail; R_1 indicates the reaction attending the same. With W_1 bucking the rail as shown, the truck advances, and shortly all of its wheels are on the curve.

The tape size or circumference is theoretically the same for all the wheels, but the radius of the curve which the outer wheels engage is larger than the radius of the curve engaged by the inner wheels. Accordingly, the length of the arc traversed by the outer wheels encompasses a smaller center angle of the curve than that simultaneously traversed by the inner wheels. The inner wheels therefore run ahead of the outer wheels. This causes a rotation of the truck in regard to the track, with contact point 1 as a moving center of rotation. Shortly the flange of wheel W_2 contacts with the inner rail head, thus stopping this rotation and thereby preventing the inner wheels from a further advance ahead of the outer ones. This position is shown in Fig. 2, where the truck is moving in the direction of the arrow and the wheels are all on the curve. It will be noted that in this position, the wheels W_1 and W_2 contact with the outer and inner rails respectively at points 1 and 2. The reaction between the flange of the wheel W_2 and the inner rail is denoted by R_2.

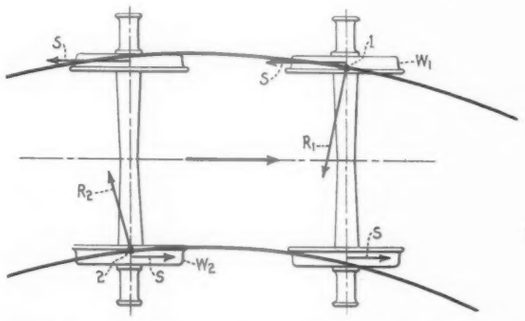


Fig. 2—Final Position of Truck While Rounding a Curve

The position shown is unchangeably maintained by the truck during the remainder of its progress on the curve and is herein referred to as the "final" position. Its chief characteristic is that the inner wheels are prevented from running further ahead of the outer ones. The inner wheels are thus compelled to roll over a shorter length of rail than is simultaneously traversed by the outer ones. This compels a wheel slippage on the rail to the extent of the difference in length of rail traversed. Where this slippage takes place, if between the inner wheels and the rail or between the outer wheels and the rail, is immaterial, although with other con-

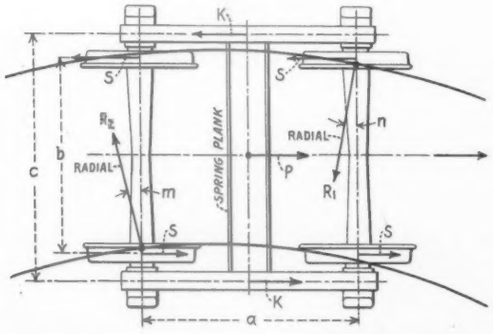


Fig. 3—Force Application on the Truck as a Whole

ditions equal, that wheel of each pair slips which carries the smallest load. In Fig. 2 the frictional forces which resist this slippage are denoted by S, and it is the value of these forces which largely controls the intensity of the transverse loading of the truck side frame induced by movement of the truck on curved track.

During the period of time from the entrance of the leading truck of a car on the curve until the trailing truck is in final position, the trucks are slowly turning on their center plates. This turning is resisted by the friction between the center plates. For the leading truck, the moment from these frictional forces adds to the moment from the slippage forces

S, while for the trailing truck their effect is a subtraction. The bolster wear faces of the side frames, pushing against the ends of the truck bolster, effect the turning, and if the reactions developed between these faces is denoted by K, then Kc expresses the value of the resistance offered.

Determination of Forces on Trucks

Fig. 3 shows the force application on the truck as a whole. That part of the total truck resistance induced by the wheel slippage on the curve is denoted by P. P therefore denotes the value of the propelling force that must be applied to the center plate to effect this slippage. An application of the laws of equilibrium gives:

$$R_2 \text{ sine } m + R_1 \text{ sine } n = P$$
$$R_2 \cos m = R_1 \cos n$$
$$R_1 \cos na = 2Sb + Kc$$

The first equation is important as furnishing the basis for a measure of the truck resistance caused by the wheel slippage on a curve; the last equation as furnishing the means needed for a measure of the transverse loading on the truck side frame induced by the curve.

Angles n and m denote the deviation from radial positions assumed by the truck axles. The extent of this deviation depends upon the squareness of the truck. The angles are greater for a so-called loose or flexible truck than for a square truck. For the square truck these angles are always so small that their cosines are practically equal to 1.00. The second equation thus becomes

$$R_2 = R_1 = R$$

and the third equation

$$Ra = 2Sb + Kc$$
$$\text{or } R = \frac{2Sb + Kc}{a}$$

If u is the coefficient of friction of slippage between the wheel and the rail, and if Q is for each pair of wheels the smallest pressure on the rail of one wheel, then

$$S = Qu$$

This value of S, inserted in the formula for R, gives:

$$R = \frac{2Qub + Kc}{a}$$

This is the fundamental formula of this investigation. It gives the value of the reactions between wheel flanges and rail caused by wheel slippage on a curved track, and furnishes

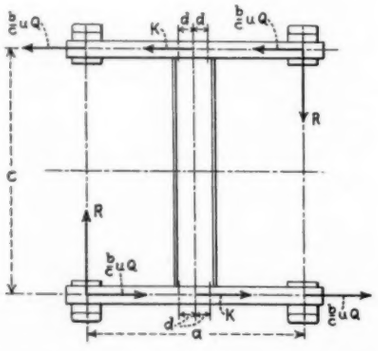


Fig. 4—Force Application on Truck Frame

the means whereby the transverse bending moment on the side frame caused by the curve action can be readily determined.

Fig. 4 indicates the force application on the truck structure with wheels and axles removed and substituted by the forces these parts apply to the framework of the truck. It is evident that reactions R are transmitted directly to the framework by means of the wheels, the axles, the brasses and the boxes; and that the horizontal axle pressure on the boxes equals:

$$\frac{b}{c}S \text{ or } \frac{b}{c}Qu$$

The force P is omitted in Fig. 4 as having no bearing on the transverse frame loading.

Bending Moment Due to Wheel Slippage

The distance from the center of the side frame to the outermost point where the squaring action is resisted is denoted by d. For cases with spring planks riveted to the side frame, d therefore denotes the distance from the center of the frame to the rivet line farthest from this center. If M_b denotes the maximum transverse bending moment on the side frame caused by the curve, then

$$M_b = R\left(\frac{2}{a} - d\right)$$
$$\text{or } M_b = \frac{2Qub + Kc}{a}\left(\frac{a}{2} - d\right)$$

This value for M_b is true for the leading truck during the period of curve entrance, or before the two trucks are in final position on the curve. After the final positions are effected, the value of M_b becomes smaller, because the turning operation of the truck on its center plate has ceased.

In order to obtain results true to actual conditions from the application of the formulas, it is important that well judged values be assumed for the symbols entering the formula, and especially is this true of the value assumed for u, the coefficient of friction of the wheel slippage. It varies greatly with the train speed. Marks' handbook gives 24 per cent to start and this value is herein used for u, although it is probable that a sanded rail justifies a somewhat higher figure. The same value has also been used for the coefficient of friction between the center plates in the derivation of the value of K. This estimate of K also assumes the full centerplate load concentrated 5½ in. from its center, and assumes no side bearing load whatever. For the 40- and 55-ton frames a value for d of 8 in. and for the 70-ton frame a value of 10 in. has been used. As a value for Q has been used 40 per cent of the total pressure on the rail of one pair of wheels. This corresponds approximately to a 5 in. super-elevation of rail.

Under the above assumptions, and at starting, the following values are obtained for R and M_b:

	R Reaction between wheel flange and rail. Resulting from track curvature	M_b Maximum transverse bending moment on one frame at distance d from center. Resulting from track curvature.
40-ton truck. 5 ft. 6 in. wheel base. Fully loaded	7,210 lb.	180,250 in.-lb.
55-ton truck. 5 ft. 6 in. wheel base. Fully loaded	9,830 lb.	245,750 in.-lb.
70-ton truck. 5 ft. 10 in. wheel base. Fully loaded	10,440 lb.	261,000 in.-lb.

After the car gets under way, the value of u rapidly decreases with an increase in train speed, so that for 20 miles per hour, as given by Marks' handbook, it is about 7 per cent. Also after both car trucks are once in final position on the curve, the value of K becomes zero or passively negative. The effect of these conditions is to greatly reduce the loading of the side frame, but they do not in any sense invalidate the results heretofore given, which apply to conditions of maximum side frame loadings from this action, which occur at the time of starting.

Effect of Coupler Pull and Super-elevation of Rail

So far no attention has been paid to the influence on side frame loading caused by the coupler pull, the super-elevation

of the rail and the centrifugal force, the first two of which induce an inward radial pressure on the truck center plate. If D is the coupler pull, the mean curve radius 600 ft., the distance between truck centers 30 ft., and if the inward force on the center plate caused by this pull is R_3 then it can be shown that,

$$R_3 = 0.036\ D$$

Again, if the super-elevation of the rail is 5 in., the angle of the transverse slope is about 4½ deg.; if U is the total center plate pressure, and if the inward force on the center plate caused by this slope is R_4, then

$$R_4 = U \text{ sine } 4\tfrac{1}{2} \text{ deg.}$$
$$R_4 = U\ 0.078$$

The total value of the inward force on the center plate from these two causes thus becomes

$$R_3 + R_4 = 0.036D + 0.078U$$

For a coupler pull of 100,000 lb., and for fully loaded cars, the inward pressure at the center plates from these two forces alone is:

$R_3 + R_4$ for 40-ton truck = 8,389 lb.
$R_3 + R_4$ for 55-ton truck = 10,180 lb.
$R_3 + R_4$ for 70-ton truck = 11,080 lb.

$R_3 + R_4$ accordingly increases the reaction between the wheel flange and the rail for the trailing inner wheel, with a corresponding decrease for the leading outer wheel. $R_3 + R_4$ can be considered equally assumed by the four ends of the side frames. This, when combined with the results heretofore given for M_b alone, results in maximum transverse bending moments as follows:

40-ton frame, 232,680 in.-lb.
55-ton frame, 305,594 in.-lb.
70-ton frame, 330,250 in.-lb.

The effect of centrifugal force is of course zero for the start, and as the above figures are for starting conditions, centrifugal force need not be considered, as it does not affect them either as an addition or a subtraction. In fact, at no time in ordinary freight service does centrifugal force reach a value demanding consideration. What effect it does have, however, is a subtraction from the loading represented by $R_3 + R_4$.

After the car is once well on the curve, moving along with fair speed, the above values are greatly reduced. For instance, for a 70-ton truck, a train speed of 12 miles per hour, trucks fully on the curve, with a coupler pull of 100,000 lb., and with a 5 in. super-elevation of the rail, the maximum transverse bending moment on one side frame is 136,420 in.-lb., instead of the value 330.250 in.-lb. for starting. For this case the friction coefficient for wheel slippage on the rail becomes 0.073, while K in the general formula is of course in this case zero, or passively negative.

For conditions of comparatively large side bearing load, the severity of the transverse side frame loading is increased by the increase of its effects in the value of K. For roller side bearings this increase is negligible, although for friction side bearings it should doubtless be given consideration.

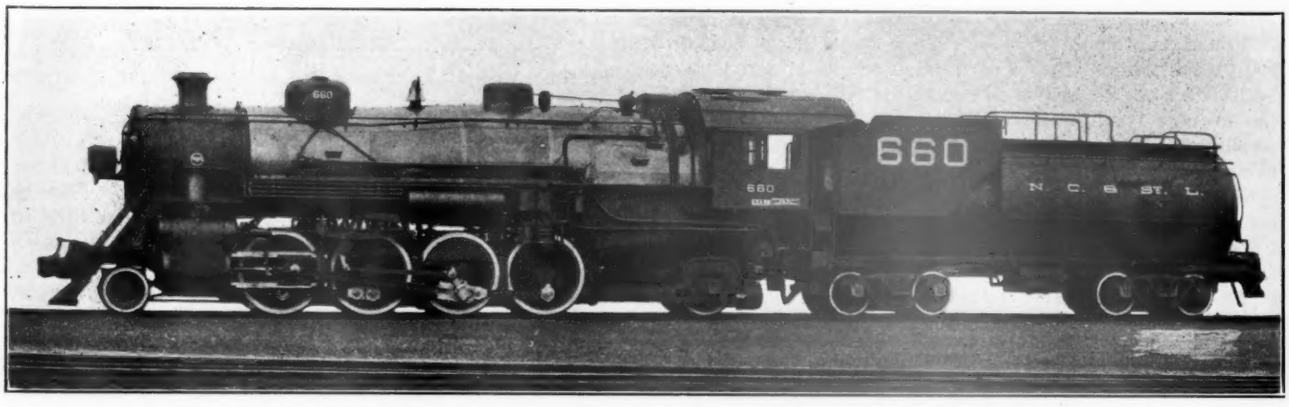
Locomotive Service Tests on the N. C. & St. L.

Engine with Nicholson Thermic Syphons Runs Against One of Similar Design Not So Equipped

DURING THE EARLY PART of the present year the Nashville, Chattanooga & St. Louis made a series of road tests of two Mikado type locomotives of similar dimensions, one of which was equipped with Nicholson thermic syphons, to determine a comparison of the performance of thermic syphon-equipped locomotives with others not so equipped. The results of these tests are of interest in that they confirm the results which have been obtained in similar tests on other railroads, in which the locomotives equipped with the syphons have invariably shown a reduction in fuel consumption per one thousand gross ton miles.

A comparison of the principal dimensions of the two locomotives is shown in one of the tables. It will be seen that, while they are generally similar, there are a number of slight differences. The cylinders of engine No. 651 are of slightly larger diameter than those of engine No. 660, the syphon-equipped locomotive, while the driving wheels of the latter locomotives are three inches larger in diameter than those of the non-syphon locomotive. These differences in dimensions account for the difference in the tractive effort, which is 58,300 lb. for engine 651 and 54,800 lb. for engine 660.

The only other difference worthy of comment is in the distribution of the heating surface. Engine No. 660, which is one of 12 new Mikado type locomotives equipped with thermic syphons delivered to the Nashville, Chattanooga & St. Louis in November, 1922, has five more superheater units than the earlier class to which engine No. 651 belongs, and 26 less 2¼-in. tubes. The result of these differences is that



N. C. & St. L Locomotive No. 660 Equipped with Nicholson Thermic Syphons

the new locomotive has 139 sq. ft. less tube and flue heating surface and 110 sq. ft. more superheating surface. Both locomotives have the same size firebox, the only difference in firebox heating surface being that resulting from the application of two syphons, which are installed with two of the four arch tubes used in the older locomotives. Including arch tubes and syphons, engine 651 has a total of 317 sq. ft. of firebox heating surface, while engine 660 has a total of 371 sq. ft. of firebox heating surface.

Owing to the fact that a smaller tender is used with the new locomotives, there is a difference in the total weight of engine and tender of approximately 16,000 lb. in favor of the new locomotive.

The syphon-equipped locomotive had been in service about 60 days prior to the beginning of the tests. Locomotive 651 was turned out of the back shop about 40 days prior to the tests and was in good condition. Throughout all of the test runs the same crews operated both locomotives, which are equipped with stokers, and were fired by a traveling fireman.

The tests were made on the Chattanooga division between Nashville, Tenn., and Cravens, a district 149 miles long. Southbound, there are two ruling grades, one about five miles long, of 0.92 per cent and the other about seven miles long, of 0.93 per cent. Northbound, there is one ruling grade of 0.94 per cent, six miles long. In addition to these grades, there are pusher grades, where a helper is used in both directions, over the Cumberland Mountain.

DIMENSIONS OF LOCOMOTIVES USED IN N. C. & ST. L. THERMIC SYPHON TESTS

	Without syphons	With syphons
Locomotive No.	651	660
Type	Mikado	Mikado
Tractive force, lb.	58,300	54,800
Weight on drivers, lb.	220,000	220,000
Weight of engine and tender in work. order, lb.	481,340	465,000
Cylinders, diameter and stroke, in.	26 5/16 by 30	26 by 30
Diameter driving wheels, in.	60	63
Heating surface, sq. ft., 5½-in. flues	1,090	1,231
2¼-in. tubes	2,407	2,127
Firebox	290	290
Arch tubes	27	12.5
Syphons	....	68.5
Total, evaporating	3,814	3,729
Superheater	882	992
Firebox, length and width, in.	114⅛ by 84¼	114¼ by 84¼
Grate area, sq. ft.	66.7	66.7
Tender capacity, water, gal.	10,187	9,739
Coal, tons	16	16

A dynamometer car was used for recording the speed, drawbar pull and the location of throttle and reverse lever positions. Water calculations were made by measuring the water before and after filling the tank and coal calculations were made by measurement of the amount of coal in the tank before the beginning and after the completion of each run. The tests were made with through tonnage freight trains, with a tonnage rating southbound of 1,800 tons and northbound of 1,600 tons. The tonnage was calculated by using the stenciled weight of empty cars and the scale weights of loads, taken from the bills.

Test data were compiled for three trips southbound and four trips northbound. The average results of test trips in both directions are shown in one of the tables. Southbound, the average conditions were favorable for the non-syphon locomotive. The trip with this locomotive included an average of 1 hr. 15 min. less dead time than those with the syphon-equipped locomotive and the atmospheric temperature averaged more than 12 deg. higher. Both the average trainload handled by the syphon-equipped locomotive and the average speed while running was higher than for the other locomotive, and the fuel consumption per thousand gross ton miles was 9.91 per cent less. Comparing the performance on a drawbar horsepower-hour basis, the syphon locomotive showed a fuel consumption of 4.02 per cent less than the other locomotive, while the equivalent evaporation per pound of coal was 14.26 per cent greater.

On the northbound trip the conditions as to delays favored the syphon-equipped locomotive; the average dead time of 2 hr. 35 min. per trip with this locomotive was 52 min. less than the average for the other locomotive. The difference in average tonnage on the northbound trip was slight, although the number of cars averaged one less per train for the syphon-equipped locomotive than for the non-syphon-equipped locomotive.

On these test trips the syphon-equipped locomotive showed an average fuel consumption 11.52 per cent less per thousand gross ton miles than the other locomotive. On these trips the fuel rate per drawbar hp.-hr. of the syphon-equipped locomotive was 8.57 per cent less than that of the non-syphon-equipped locomotive, while the equivalent evaporation per pound of coal was only 7.01 per cent greater.

COMPARISON OF AVERAGE PERFORMANCE OF SYPHON AND NON-SYPHON EQUIPPED LOCOMOTIVES

	Southbound			Northbound		
	Loco. 651, without syphons	Loco 660, with syphons	Difference, per cent	Loco. 651, without syphons	Loco. 660, with syphons	Difference, per cent
Atmospheric temperature, deg. F.	62.6	49.0	....	58.0	41.2	....
Total time on road, hr., min.	10–34	11–26	....	10–04	8–43	....
Total running time, hr., min.	6–52	6–33	....	6–37	6–03	....
Total dead time, hr., min.	3–42	4–53	....	3–27	2–35	....
Speed, m. p. h.	21.81	22.81	+4.59	22.64	24.76	+9.36
Number of stops	12	13	....	12	12	....
Tons per train	1,763	1,806	+2.38	1,569	1,555	—.89
Cars per train	42	42	....	40	39	....
Gross ton miles, thousands.	262.6	270.0	+2.82	235.3	231.8	—1.49
Total ft. lb., millions	12,838	12,351	—3.79	10,206	9,887	—3.13
Total coal fired, lb.	39,927	34,155	—7.51	31,148	27,392	—12.06
Total water, lb.	222,639	235,580	+5.81	195,403	183,453	—6.12
Coal per hr., per sq. ft. grate area	81.2	78.4	—3.46	70.7	68.1	—3.68
Equivalent evaporation, lb. water per lb. coal	6.03	6.89	+14.26	6.27	6.71	+7.01
Coal per 1,000 gross ton-miles, lb.	140.2	126.3	—9.91	133.7	118.3	—11.52
Water per 1,000 gross ton-miles, lb.	847.9	872.3	+2.88	829.8	792.2	—4.53
Coal per drawbar hp.-hr., lb.	5.72	5.49	—4.02	6.07	5.55	—8.57
Water per drawbar hp.-hr., lb.	34.52	37.83	—9.59	37.82	36.86	—2.54

In neither case was there any difficulty in maintaining boiler pressure. The temperature of the steam entering the cylinders, however, averaged 19 deg. higher in engine 660 than in engine 651, the temperature being 607 deg. and 588 deg., respectively.

Combining the runs made by each locomotive in both directions, it will be seen by referring to the table that the syphon equipped locomotive handled a slightly larger average train load over the division in an average of almost one-half hour less time, with 10.7 per cent less fuel per one thousand gross ton miles.

AVERAGE PERFORMANCE OF COMBINED NORTHBOUND AND SOUTHBOUND RUNS

	Loco. 651, without syphon	Loco. 660, with syphon	Difference
Average running time, hr.	6.742	6.3	—6.55
Average speed, m.p.h.	22.225	23.785	+7.0
Tons per train	1,666.0	1,680.5	+0.9
Gross ton-miles, thousands.	248.95	250.9	+0.8
Lb. coal per 1,000 gross ton-miles	136.95	122.3	—10.7
Lb. water per 1,000 gross ton-miles	838.85	832.25	—0.8
Average drawbar hp.	867.0	889.5	+2.59
Lb. coal per drawbar hp.-hr.	5.87	5.48	—6.6

"THE PIEDMONT LIMITED" is the name of Nos. 33 and 34, the new trains between New Orleans and New York, over the Pennsylvania, the Southern, the West Point Route, and the Louisville & Nashville railroads. Dr. Howard E. Rondthaler, president of Salem College, Winston-Salem, N. C., has been awarded the $200 prize offered for the most appropriate name. Over 21,000 letters were received, containing 63,000 suggestions, coming from every state of the Union. These trains traverse the country along the eastern slope of the Blue Ridge, which is known as the Piedmont section. Thirty years ago this line was advertised and known as the Piedmont Air Line.

Reducing the Corrosion in Steel Cars

Steel Containing a Small Percentage of Copper Adopted to Prevent Rapid Deterioration

By J. J. Tatum
Superintendent Car Department, Baltimore & Ohio

DURING THE PERIOD of government control of the railroads, the writer, as manager of the Car Repair Section of the Railroad Administration, had an unusual opportunity for studying the condition of car equipment on the various railroads of this country. The observations made at that time proved conclusively that steel freight equipment built in recent years has been deteriorating very rapidly due to corrosion. On the other hand, it is noticeable that occasionally iron and steel sheets are found well preserved after long periods of service. To determine the reason for the difference in the life of such material, some of the structures which had shown high resistance to corrosion were carefully analyzed.

Fig. 1—Box Car with Iron Superstructure, Built During the Civil War. The Metal, Although Unprotected, Shows Very Little Deterioration

In 1862 the Mount Clare shops of the Baltimore & Ohio built a considerable number of box cars with iron bodies and wood underframes. Some of these cars are still in existence and the original sheets in the bodies are well preserved as shown by the car illustrated in Fig. 1, which is still in service as shop car at the Mount Clare shops. Because the metal in the superstructure of this car was in such good condition—notwithstanding it did not receive the usual protection of frequent painting, as has more modern equipment—in 1917 a piece of it was taken from the car and sent to the laboratory for analysis. The chemical composition of the sheet was found to be as follows: Carbon, very low; sulphur, .020 per cent; phosphorus, .034 per cent; manganese, none; copper, .54 per cent.

The analysis of low carbon steel now generally used for car work is approximately as follows: Carbon, .18 per cent; sulphur, .045 per cent; phosphorus, .015-.035 per cent; manganese, .50 per cent; copper, none. It is interesting to compare these two analyses with the composition of the copper-bearing steel which the Baltimore & Ohio is now using in passenger and freight cars. This shows an analysis as follows: Carbon, low; sulphur, .040 per cent; phosphorus, .008 per cent; manganese, .38 per cent; copper, .25 per cent.

Another instance of metal resisting corrosion during a long period of exposure was found at Cumberland, Md. The Baltimore & Ohio built a rolling mill at this point in 1870, which is still standing. Recently a material reclaiming plant

was established in this mill. The supports from the furnaces installed when the mill was originally placed in operation were intact and several of the furnace stacks still remained. One of the stacks was removed because of the necessity of locating a furnace in the space it occupied. It was thought

Fig. 2—Corrosion Due to Rain Washing Through Coal Indicated by White Deposits on Side of Car and Under Hoppers

at the time it would be necessary to build a new stack for the furnace being installed. When the old stack was removed, to our surprise it was found that the metal showed very little deterioration notwithstanding it had been erected, as nearly as could be established, about 50 years ago.

There is a great deal of smoke from locomotives at Cumberland and it would naturally be expected that the corrosive gases would affect the metal in the stack. In order to find the composition of this material which remained in such good condition, a piece was cut from the stack and sent to the laboratory. The chemical composition was found to be as follows: carbon, .012 per cent; sulphur, .030 per cent; phosphorus, .177 per cent; manganese, .05 per cent; copper, .44 per cent. This stack was wrought iron; it was not as good a grade as the iron found in the old box car already mentioned, being higher in sulphur and very much higher in phosphorus; but even so, with .44 per cent copper, it gave far better service than stacks made from ordinary steel as now manufactured.

A large portion of the side walls of the Cumberland rolling mill were covered with galvanized, corrugated sheets. This metal was also in good condition, showing practically no deterioration. A piece was cut from one of the sheets and sent to the laboratory; it showed carbon, very low; sulphur, .022 per cent; phosphorus, .092 per cent; manganese, none; copper, .35 per cent.

Following the investigation further with a view to finding a metal most suitable for car construction which would give longer life and would not deteriorate from corrosion so rapidly as the metal which the Baltimore & Ohio had been using, the action of the acids in coal was studied. A steel hopper car loaded with bituminous coal which had been standing for some time is shown in Fig. 2. It will be noted that a white coating has collected on the sides of the hopper sheets and there are white deposits on the track and ties left from the rain water after washing through the coal. These salt deposits were collected and sent to the chemical laboratory for analysis. The investigation showed the deposits to be sulphate of iron. Part of it was light green in color and crystallized; another pile was whitish, finer and had lost the water of crystallization. The deposits were found to contain free acid which would be very corrosive to steel sheets.

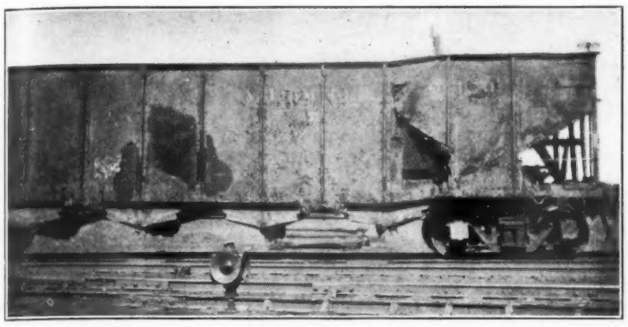
A piece of copper steel plate and a piece of ordinary steel plate were immersed in a saturated solution of this salt. The result of this test was as follows:

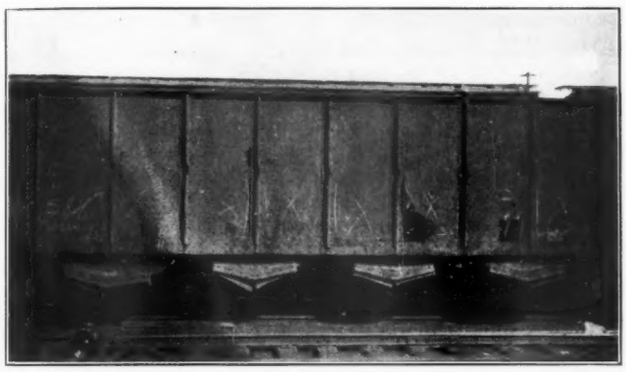
Fig. 3—All-Steel Car after 12 Years' Service, Weakened by Corrosion so That It Buckled at the Center

Copper Steel			
Weight of piece 18.383 gms.	Surface exposed 6.094 sq. in.	Amount dissolved .017 gms.	Amount per sq. in. .0028 gms.
Plain Steel			
Weight of piece 26.928 gms.	Surface exposed 6.750 sq. in.	Amount dissolved .0480 gms.	Amount per sq. in. .0071 gms.

Further investigation of both freight and passenger equipment showed that plates and structural shapes used in the construction of cars which were exposed to lading or atmos-

phere were deteriorating very rapidly, requiring replacement in from 10 to 12 years. Figs. 3, 4 and 5 show all-steel coal and coke cars which were built in 1911. The steel in the sides and floors of these cars had deteriorated to such an





Figs. 4 and 5—Steel Cars with Sides so Weakened by Corrosion That They Will Not Hold Lading

extent that they would not hold the lading and did not have sufficient strength to withstand the stresses imposed in service, making it necessary to rebuild the cars entirely. The only parts which could be reclaimed were the center sills, bolsters, inclined floor supports and, in some instances, the end sills and short draft sills from the bolsters to the end sill in addition to the draft gear, air brakes and trucks. The serviceable parts of the cars which could be used in rebuilding are shown in Fig. 6. The center sills were reinforced and the superstructure re-erected, the finished car being shown in Fig. 7.

Copper-bearing steel was used in rebuilding these cars and it is expected that this material will give much longer service than was obtained from the ordinary steel which was originally used. Exhibit A shows the chemical and physical properties of copper-steel sheets required by the Baltimore & Ohio specifications. It is felt that the investigation outlined above is conclusive and convincing evidence that steel with a small content of copper will give much longer life in car equipment.

Exhibit A

Specifications for Copper-Bearing Miscellaneous Sheets and Structural Steel

1. Scope—This specification takes effect from date, superseding all specifications for this material, and covers material used in coal car construction, passenger car roofs, and other purposes for which its use has been approved by the general superintendent of motive power.

MANUFACTURE

2. Process—The steel shall be made by the openhearth process.

CHEMICAL PROPERTIES AND TESTS

3. Chemical Composition—(a) The steel shall conform to the following requirements as to chemical composition:

Phosphorus, not over	0.05 per cent
Sulphur, not over	0.05 per cent
Copper, not less than	0.20 per cent

Ladle Analysis (b) Analysis made from the test ingot made by the manufacturer shall conform to the requirements in Section 3-A.

Check Analysis (c) Analysis made by the purchaser from drillings shall conform to the requirements in Section 3-A.

PHYSICAL PROPERTIES AND TESTS

4. Tensile Tests—(a) The material shall conform to the following requirements:

Tensile strength, lb. per sq. in.	50,000-65,000
Yield point, min., lb. per sq. in.	0.5 tens. str.
Elongation in 8 in. min. per cent	1,500,000 ÷ tens. str.

(b) The yield point shall be determined by the drop of the beam of the testing machine.

5. Modifications—(a) For material over ¾ in. in thickness, a deduction of 1 from the percentage of elongation specified in 4-A shall be made for each increase of ⅛ in. thickness above ¾ in. to a minimum of 18 per cent.

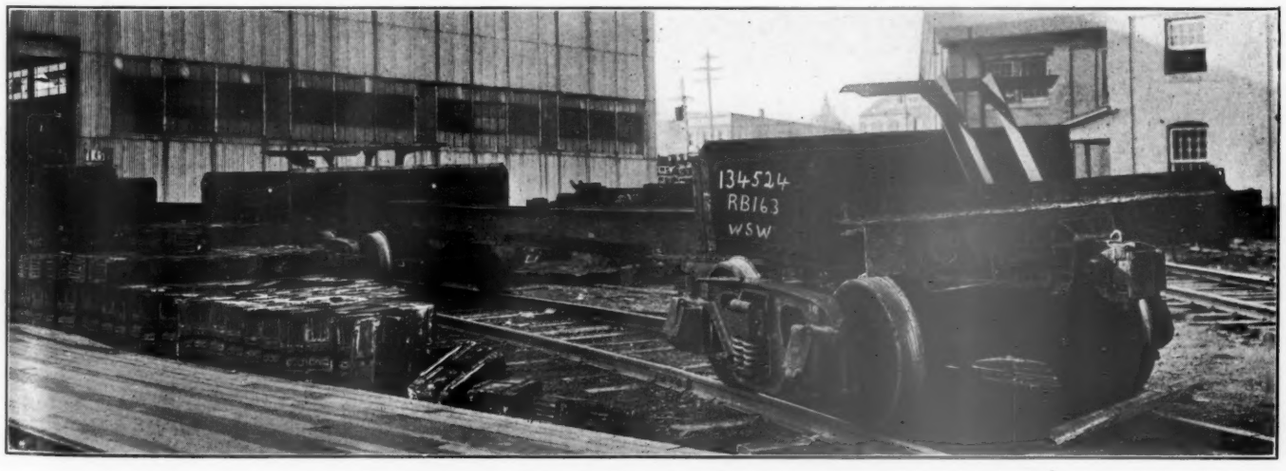


Fig. 6—All That was Worth Saving from a Hopper Car, Built in 1911

(b) For material under 5/16 in. in thickness, a deduction of 2.5 from the percentage of elongation in 8 in. specified in Section 4-A shall be made for each 1/16 in. decrease in thickness below 5/16 in.

6. Bend Test—(a) The test specimen shall be bent cold 180 deg. without cracking on the outside of the bent portion as follows: For material ¾ in. or under in thickness, flat on itself; for material over ¾ in. to and including 1¼ in. thickness around a pin the diameter of which is equal to the thickness of the specimen; and for material over 1¼ in. in thickness, around a pin the diameter of which is equal to twice the thickness of the specimen.

7. Test Specimens.—(a) Tension and bend test specimens shall be taken from the finished rolled material.

(b) Tension and bend test specimens shall be of the full thickness of material as rolled and may be machined to the form and dimensions shown in Fig. 8, or with both edges parallel.

(d) When ordered in thickness. The thickness of each plate shall not vary more than 0.01 in. under that ordered.

WORKMANSHIP AND FINISH

10. (a) All material must be straight and smooth and those which are buckled and have irregular surfaces will be rejected.

(b) The finished material shall be free from injurious defects and shall have a workmanlike finish.

TABLE NO. 1

Ordered thickness inches	Permissible excess in average weights per square foot of plates, for widths given, expressed in percentages of nominal weights									Ordered thickness inches
	Under 48 in.	48 to 60 in. exclusive	60 to 72 in. exclusive	72 to 84 in. exclusive	84 to 96 in. exclusive	96 to 108 in. exclusive	108 to 120 in. exclusive	120 to 132 in. exclusive	132 in. or over	
Under 1/8	9	10	12	14	..	..	..	..	..	Under 1/8.
1/8 to 7/16, exclusive	8	9	10	12	..	..	..	..	..	1/8 to 7/16, exclusive.
7/16 to 1/4, exclusive	7	8	9	10	12	..	..	..	..	7/16 to 1/4, exclusive.
1/4 to 5/16, exclusive	6	7	8	9	10	12	14	16	19	1/4 to 5/16, exclusive
5/16 to 3/8, exclusive	5	6	7	8	9	10	12	14	17	5/16 to 3/8, exclusive.
3/8 to 7/16, exclusive	4.5	5	6	7	8	9	10	12	15	3/8 to 7/16, exclusive.
7/16 to 1/2, exclusive	4	4.5	5	6	7	8	9	10	13	7/16 to 1/2, exclusive.
1/2 to 5/8, exclusive	3.5	4	4.5	5	6	7	8	9	11	1/2 to 5/8, exclusive.
5/8 to 3/4, exclusive	3	3.5	4	4.5	5	6	7	8	9	5/8 to 3/4, exclusive.
3/4 to 1, exclusive	2.5	3	3.5	4	4.5	5	6	7	8	3/4 to 1, exclusive.
1 or over	2.5	2.5	3	3.5	4	4.5	5	6	7	1 or over.

8. Number of Tests—(a) A tension and one bend test shall be made from each melt for each thickness of plate material and from one of the largest and one of the smallest sections of structural material rolled. If one test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(b) If the percentage of elongation of any tension test specimen is less than that specified in Secton 4-A and the fracture is outside the middle third of the gage length, as indicated by the scribe scratches marked on the specimen before testing, a re-test shall be allowed.

PERMISSIBLE VARIATIONS IN WEIGHT AND THICKNESS

9. (a) The thickness of each plate shall not vary more than .01 in. under that ordered. The overweight of each lot in each shipment shall not exceed the amount shown in the following:

(b) The cross-section or weight of each piece of steel shall not vary more than 2.5 per cent from that specified, except in the case of sheared plates, which shall be covered by the following permissible variations. One cubic inch of rolled steel is assumed to weigh 0.2833 lb.

(c) When ordered to weight per square foot. The weight of each lot in each shipment shall not vary from the weight ordered more than the amount given in Table 1.

THE GALVESTON CAUSEWAY CONSTRUCTION COMPANY, Galveston, Tex., formerly Larkin & Sangster, Inc., and its surety, the United States Fidelity & Guarantee Company, must pay the Galveston, Harrisburg & San Antonio, and other railroads, $652,626 for excess cost of the causeway connecting Galveston with the mainland of Texas. This is in accordance with the decision of the District court and of the Court of Appeals which the United States Supreme Court sustained on April 30; a writ of certiorari was denied. The contractor having become insolvent and unable to proceed with the work, it was taken over and completed by the railroads. Their claim was for the damage sustained by the contractor's breach, being the difference between the contract price and the amount they had been compelled to pay to complete the contract.

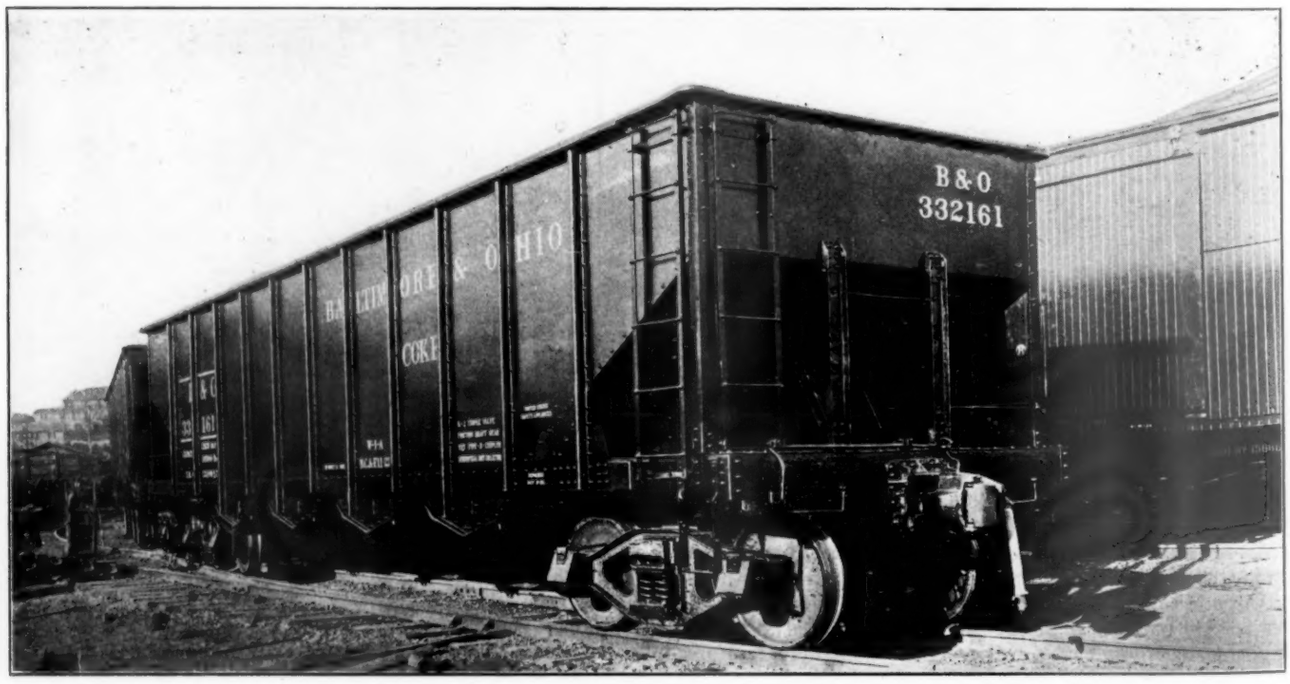


Fig. 7—Hopper Car Rebuilt with Steel Containing Copper, Which Is Expected to Give Much Longer Service than Ordinary Steel

Strengthening the Morale of Supervisory Forces

Large Possibilities for Increasing the Efficiency in the Mechanical Department

IT IS NOT THE INTENTION in this article to criticize in any way the officers and foremen in the mechanical department. These men as a whole have shown a fine degree of loyalty in the past and are deserving of the greatest commendation. The fact that there is much room for improvement in their functioning is not due to lack of interest or loyalty on their part, but rather to the fact that the managements have not recognized their value and importance and in many cases have failed to utilize them to the best advantage.

Foreman Not Appreciated

This is indicated, for instance, by the fact that workmen have frequently refused to accept promotion because it placed much greater responsibility upon them without a corresponding increase in compensation. It has not been unusual, indeed, for men in the ranks to draw more money under piece-work conditions than did the foremen above them. The man on an hourly or piece-work basis dropped his tools when the whistle blew and gave little thought to his job until he started to work the next morning. The foreman on a monthly salary basis put in longer hours than did the workmen and carried the responsibility home with him at night. Much ado was made about the bonuses that were paid to the loyal workmen and foremen during the past year. It is not a secret that many of the foremen were sorely disappointed at the size of the bonus given them, because it did not represent nearly as much as was paid to ordinary workmen who put in a corresponding amount of overtime and carried comparatively little responsibility.

The real difficulty, however, is that the railroads have grown so fast and the organizations have become so large, that the managements have failed to recognize the strategic position which the foremen and subordinate officers hold under these conditions. In many cases the foremen are the only links between the management and the men and, in the eyes of the men, stand for the management. It is logical, therefore, that the management should carefully select every foreman and see that he is kept thoroughly posted as to the policies of the management, and knows how properly to interpret the men to the management and the management to the men. Has this been recognized to the extent that it should be? Can a foreman properly impress and lead the men if he is lacking in self-respect, and how much have some managements done to increase the self-respect of their foremen and subordinate officers?

It is not safe to draw general conclusions from specific instances. It seems unfortunate, however, that so many of the foremen are so far removed from intimate contact with the management and its policies that they feel more or less on the outside. This is not as it should be and it would seem that few things would pay better in the way of securing increased efficiency and economy of operation than for the managements to cultivate and coach these men, giving them not only a better conception of the policies of the management, but helping them to improve their methods in dealing with the men.

Training the Foremen

The industries have had this same problem to deal with and some of them have gone a long way in its solution. It was recognized in the first place that men were ordinarily selected as foremen because of their ability as craftsmen and because of their personalities. It does not follow, however, that a man who can make a good record at running a machine or at manual labor, and who seems to possess some qualifications for leadership, will actually function to advantage when he is placed in charge of a group of men. The successful foreman must understand men and know how to lead them; craftsmanship is of secondary importance.

Sherman Rogers in his book "Foremen! Spark Plugs or Grounded Wires" makes this statement: "The efficiency of a man is either raised or lowered from 15 to 50 degrees by his mental attitude toward the job, by his mental attitude toward the company, and by his mental attitude toward the foreman he is working under. Therefore, the foreman, having practical experience, is going to learn how to pull every ounce of spirit out of a man by becoming thoroughly familiar with the peculiarities of every individual under his direction. * * * The foreman of the future who is not a good reader of character; who hasn't a feeling of respect and admiration for men as a whole; who has not a pleasing personality—will find his job limited to a mighty small sphere. Foremen of the future who desire to advance will find that the development of personality and his ability to sell confidence, good will and respect to men will be a lot bigger factor in bringing an increased pay check and a higher position of authority, than his ability to 'drive' men for a short period of time."

Successful industrial leaders have therefore gone about trying to train and inspire the foremen for leadership in various ways. Incidentally, it has been found that the average foreman can handle only a limited number of men to advantage and that in some cases the groups were entirely too large and required subdivision and additional supervision. Various courses of foremanship have been prepared and in many cases the companies have stood half or all of the expense of giving these courses to the foremen under expert leadership. In some cases the men have of their own volition taken correspondence study courses. These courses, by the way, have not dealt with problems of craftsmanship, but have related entirely to the principles underlying successful industrial leadership. The greatest value of these courses, has been to broaden the vision of the men and give them a better understanding of how intelligently to direct the efforts of the workmen. Some men have gained an entirely new conception of their responsibilities and have changed the whole atmosphere of their departments.

The value of this sort of thing cannot be accurately measured in dollars and cents, but must have a very direct and large influence upon the balance sheet. Nothing is more sensitive than a human being. Very little things often can throw a whole organization out of gear and reduce it to a very low state of efficiency; just as little things can have directly the opposite effect. As one foreman said a short time ago, playing may often require very great physical exertion, and yet it does not tire one out nearly as much as the same amount of physical exertion done as work in a shop and for which a man is well paid. The most efficient organizations are those in which the men enter into the work with the same spirit as that in which they play a game. Here is where the foreman can bring about wonderful results if he has a knowledge of human values and knows how to keep the men interested in their work.

Training Methods in Industry

The committee on Foreman Training of the National Personnel Association presented a comprehensive report on

Foreman Training Methods at the meeting of that organization last November. It aimed to give "an impartial presentation of the several methods that are in most common use in the movement to improve foremanship." These included (1) the lecture method, (2) conference method, (3) test study method, and (4) field training method. No one method was more highly endorsed than another. The statement was made that: "This should be avoided. Selection of method is too closely allied to operating conditions and these are so varied that specific recommendation is impossible. Combinations or adaptations of methods are often desirable but must be arrived at through a determination of the aim desired, a study of the conditions under which the work is to be done and a matching of the method possibilities against these."

The so-called "lecture method" might include paid expert lecturers or shop talks by a staff member.

The "conference plan" would comprehend a foremanship course set up in terms of objectives to be attained rather than content to be taught, the idea being to develop the thinking of the foremen with regard to their responsibilities on the job, rather than to instruct them on new subject matter.

There are two types of the "text study method." "In the first the text is developed and presented by the company itself, and in the second the text is prepared and presented by agencies outside the company which specialize in such work and are unquestionably well equipped to handle it. In the latter group there is again a subdivision into group study work and correspondence study work."

The "field training method" for foremen is making them on the job. It should be supplemented by some other type of training in order that the foreman may gain a general perspective of his job as well as a knowledge of economics, labor and material markets, time study, wage plans, etc., etc.

Inspiring Railroad Foremen

These methods have all been used in some form or other in railroad shops. It may not be out of place to here consider some of the more recent developments in methods of training and inspiring foremen on the railroads.

The *Railway Age* in its issue of May 26 reproduced a paper by I. U. Kershner, service agent, Eastern region of the Pennsylvania System, which was presented before the New York Railroad Club at its May meeting. This described in considerable detail the work of the foremen's clubs on the Pennsylvania Railroad. These clubs held ten meetings last season, about half of which were addressed by experts from the outside and the other half by officers of the company. These talks were followed by open forum discussions and there is little question but what they were a large factor in giving the foremen and subordinate officers a larger vision of their opportunities and responsibilities and getting them to take a more intelligent interest in developing and building up the esprit de corps of the departments under them. Undoubtedly this development will be continued and extended next fall.

L. K. Sillcox, general superintendent motive power of the Chicago, Milwaukee & St. Paul, has gone about the problem in a different way. Once each year the foremen of each of the more important subdivisions of the department gather together for a two- or three-day conference or convention. The program is very carefully developed far in advance of the time of the meeting and papers on various phases of work are prepared and presented by the different members of the groups. These reports relate largely to practical problems in the work of the department, but to a certain extent the broader phases of leadership are discussed. These meetings also give the officers of the company a splendid opportunity to talk with the men as to the policies of the company and the spirit of the organization. There is too little of this sort of thing on some railroads.

Value of Conventions

Some of the roads have profited tremendously by sending their foremen to the annual conventions of their various organizations. Others have failed to take advantage of this opportunity. Anyone who has followed the foremen's or subordinate officers' conventions over a period of years can cite instance after instance of men who were inspired by these meetings and went back home and inaugurated new practices or methods which proved invaluable. It is not too much to say that the work of these organizations has been reflected in the remarkable development of the railroads up to this time. The trouble is that many managements fail to realize the value of these organizations and do not support them.

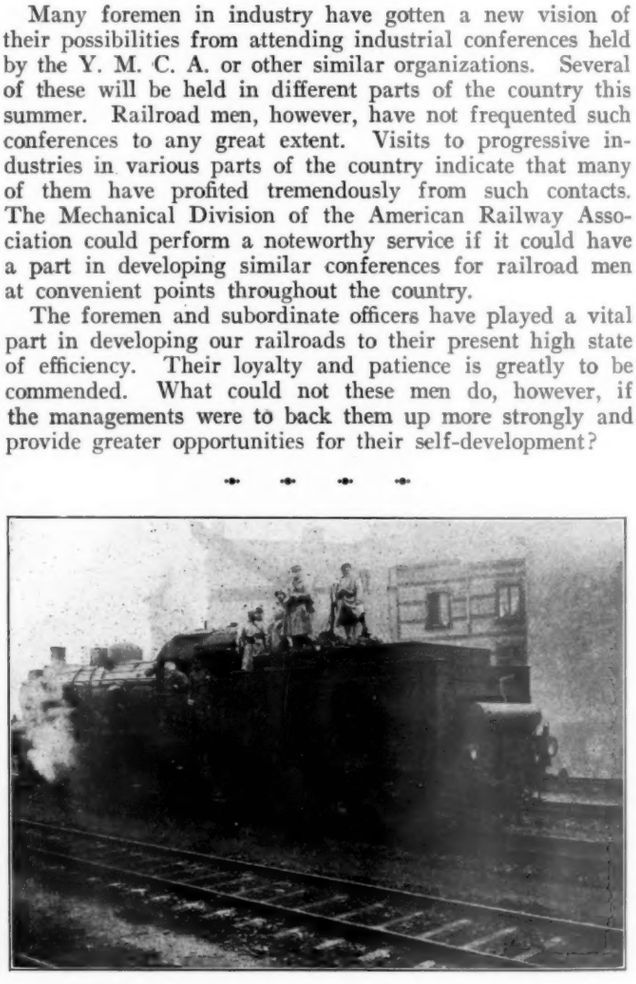
Visiting Other Roads

How often do we meet foremen or subordinate officers who know little about the practices outside of their own local point or system, except for such information as they have gained from reading convention proceedings and technical papers, but whose whole work would be improved and made more efficient if they could occasionally see at first hand what other roads are doing and talk things over with progressive men on other roads. It is a near calamity, for instance, when a shop superintendent is forced to admit with much embarrassment that he has never visited a railroad shop off his own road, much as he would like to do so.

Industrial Conferences

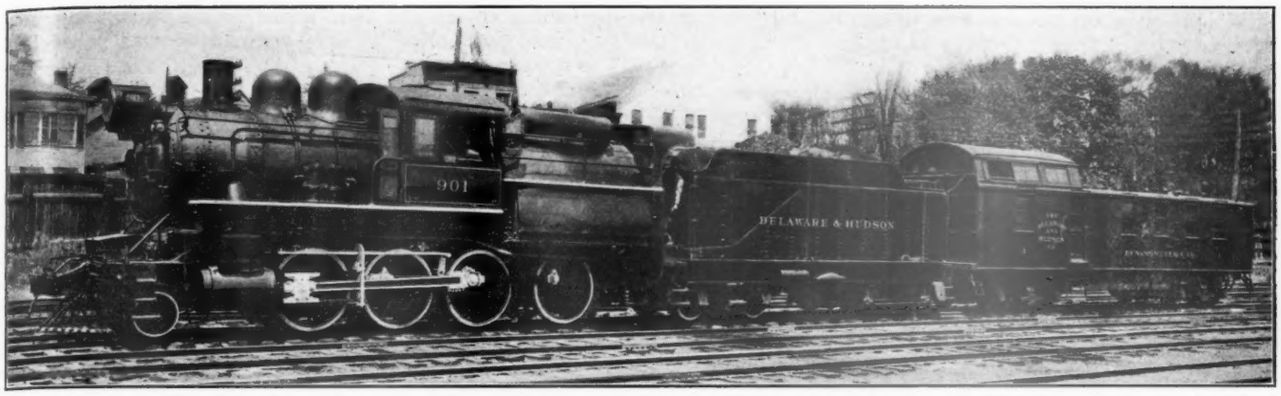
Many foremen in industry have gotten a new vision of their possibilities from attending industrial conferences held by the Y. M. C. A. or other similar organizations. Several of these will be held in different parts of the country this summer. Railroad men, however, have not frequented such conferences to any great extent. Visits to progressive industries in various parts of the country indicate that many of them have profited tremendously from such contacts. The Mechanical Division of the American Railway Association could perform a noteworthy service if it could have a part in developing similar conferences for railroad men at convenient points throughout the country.

The foremen and subordinate officers have played a vital part in developing our railroads to their present high state of efficiency. Their loyalty and patience is greatly to be commended. What could not these men do, however, if the managements were to back them up more strongly and provide greater opportunities for their self-development?



Kadel & Herbert

French Soldiery in Charge of Locomotive at Dusseldorf



The Booster-Equipped Locomotive and the D. & H. Dynamometer Car

Tender Booster Increases Tonnage 31 Per Cent

Delaware & Hudson Demonstrates Hauling Capacity of Consolidation Locomotive Equipped with This Device

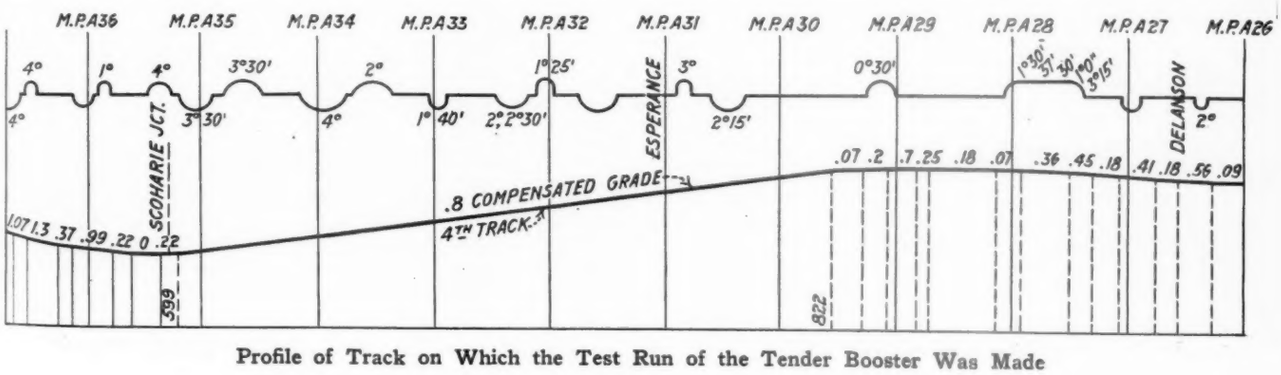
A REMARKABLE demonstration of the ability of the M & L tender booster to increase the tonnage which a locomotive can haul was given on the Delaware & Hudson on June 5. On that day a Consolidation locomotive equipped with the booster took a train 31 per cent in excess of the standard rating up a 0.8 per cent grade nearly six miles long. This heavy train was stopped on the grade and could not be started by the locomotive alone. When the booster was thrown in, the train began to move at once and was accelerated quickly to a speed of seven miles an hour. The booster used in the test is similar in general to the first design, which was described and illustrated in the *Railway Age* of July 22, 1922, page 145.

The demonstration was conducted between Scoharie Junction and Delason and was watched by about 60 representatives of railroads and supply companies. The profile of the track on which the test train ran is shown in one of the drawings. It has a long grade of 0.8 per cent, compensated, from JX tower, about mile post 35.1, to mile post 29.5. The train consisted of a superheated Consolidation locomotive, No. 901, equipped with the M & L type B tender booster, the Delaware & Hudson dynamometer car and 35 loaded freight cars. The total weight of the train, including the dynamometer car, was 2,260 actual tons, or 2,476 adjusted tons. The weights and dimensions of the locomotive are given in Table I.

The demonstration run was made with the test train on the fourth track, which has a very uniform grade. To give the spectators an opportunity to watch the performance of the locomotive and the booster a special train with flat cars equipped for observation purposes was run on a parallel track

The Test Train Pulling Up the Grade with the Train for Observers Beside It

alongside the locomotive. The test train started at JX tower and with the booster thrown in moved steadily up the grade



Profile of Track on Which the Test Run of the Tender Booster Was Made

at a speed of about 7½ miles an hour. At about mile post 33 the booster was thrown out and in three times while the locomotive was moving at about 8 miles an hour, to demonstrate the operation of the booster control mechanism. The train was stopped at mile post 30.26 at 11:01. Practically the entire train was standing on a 2 deg. 15 min. curve, the locomotive having just passed onto the tangent. With the booster cut out several attempts were made to start the train, but although the steam pressure was at the maximum, the main engines alone could not overcome the resistance at this point. When the booster was thrown in, the train immediately started and accelerated to 7 miles per hour in about 660 ft., this speed being maintained with little variation to the top of the grade.

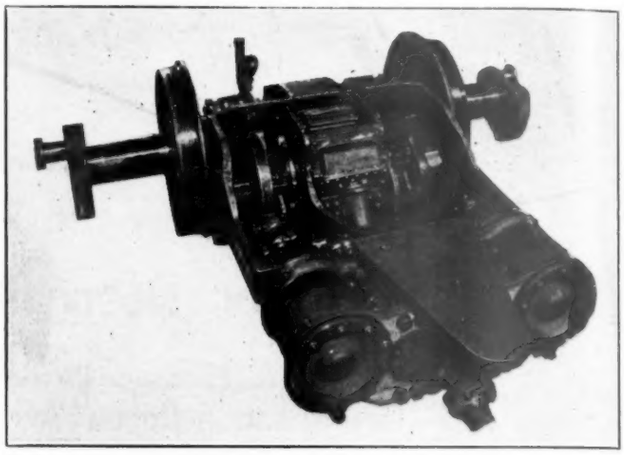
TABLE I

WEIGHTS, DIMENSIONS AND FACTORS OF LOCOMOTIVE NO. 901

Type of locomotive	Consolidation
Cylinders, diameter and stroke	21½ in. by 30 in.
Valve gear, type	Stephenson
Weights in working order:	
On drivers	183,150 lb.
On front truck	24,000 lb.
Total engine	207,150
Tender loaded	157,067
Tender empty	88,400
Wheels, diameter outside tires:	
Driving	57 in.
Front truck	30 in.
Tender	36 in.
Boiler:	
Type	Wooten
Steam pressure	215 lb.
Diameter, first ring, inside	73 in.
Firebox, length and width	120⅛ in. by 108 in.
Tubes, number and diameter	210—2 in.
Flues, number and diameter	30—5¾ in.
Length over tube sheets	14 ft. 0 in.
Grate area	90.1 sq. ft.
Heating surfaces:	
Firebox	227 sq. ft.
Tubes and flues	2,116 sq. ft.
Total evaporative	2,343 sq. ft.
Superheating	471 sq. ft.
Comb. evaporative and superheating	2,814 sq. ft.
Tender:	
Style	Rectangular
Water capacity	9,000 gal.
Fuel capacity	14 tons
Rated tractive force, 85 per cent	42,100
Cylinder horsepower (Cole)	1,628
Boiler horsepower (Cole) (est.)	1,655
Weight on drivers ÷ tractive force	4.35
Boiler horsepower ÷ cylinder horsepower, per cent	102

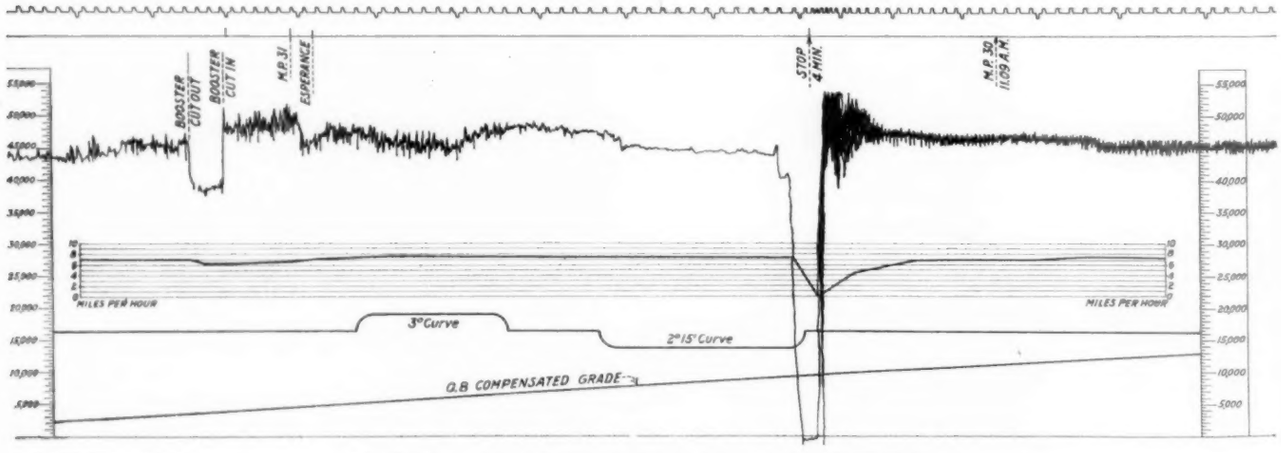
One of the illustrations is a reproduction of the dynamometer chart at this section of the run. It will be noted that the combined tractive force of the locomotive and the tender booster was over 50,000 lb. The locomotive was fired with a mixture of anthracite and bituminous coal and throughout the run the steam pressure remained quite uniform at about 210 lb. A gage was connected to the steam chest of the booster engine and from a comparison with the gage on the locomotive boiler, no drop in pressure was perceptible. The steam temperature was about 650 deg. on the locomotive and 610 deg. on the booster.

Near the left end of the dynamometer record will be noted one point where the booster was cut out and again thrown in. The sharp falling off of the tractive force and the immediate decrease in speed are convincing evidence of the work done by the booster. The chart shows the tractive force of the booster at a speed of about 7 miles an hour is about 10,000 lb.



The Booster Engine with Crank Case and Gear Covers Removed

The construction of the booster differs little from the earlier design described in the previous article in the *Railway Age*. The principal modification is in the size of the cylinders which are now 12 in. diameter by 10 in. stroke. The rated tractive force for the Type B design with 12 in. by 10 in. cylinders, 70 per cent cut-off and 36-in. wheels, is as follows: 185 lb. steam pressure, 13,300 lb.; 200 lb. steam pressure, 14,400 lb.; 210 lb. steam pressure, 15,100 lb. The weight of the booster with its truck is 28,000 lb.

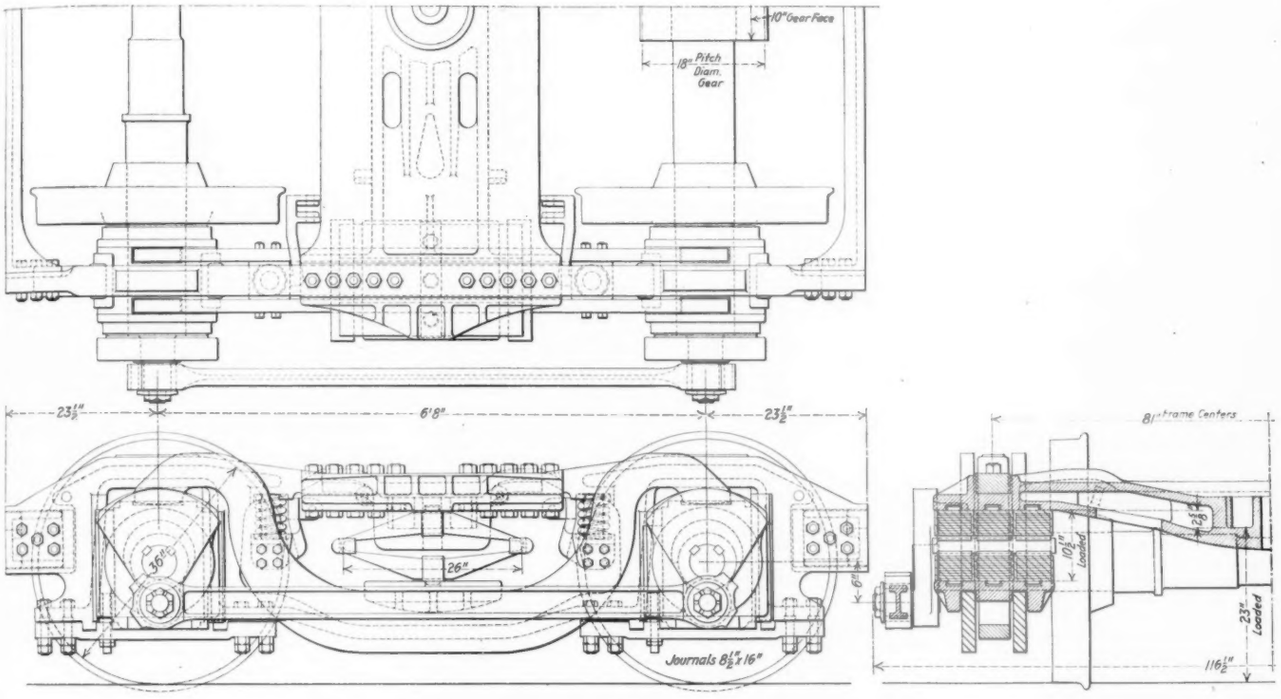


A Section of the Dynamometer Chart of the Test Run

The engine with its control and transmission is hung from a three-point suspension on the axles and is geared to the rear axle with a ratio of 2.25 to 1. The idler gear is carried in a cast-steel frame rotating about the engine shaft and is thrown into engagement with the gear on the axle by a small steam cylinder. The gear on the main shaft and the idler gear are both 8 in. in diameter with 10 in. face while the driving gear on the axle is 18 in. in diameter, 10 in. face.

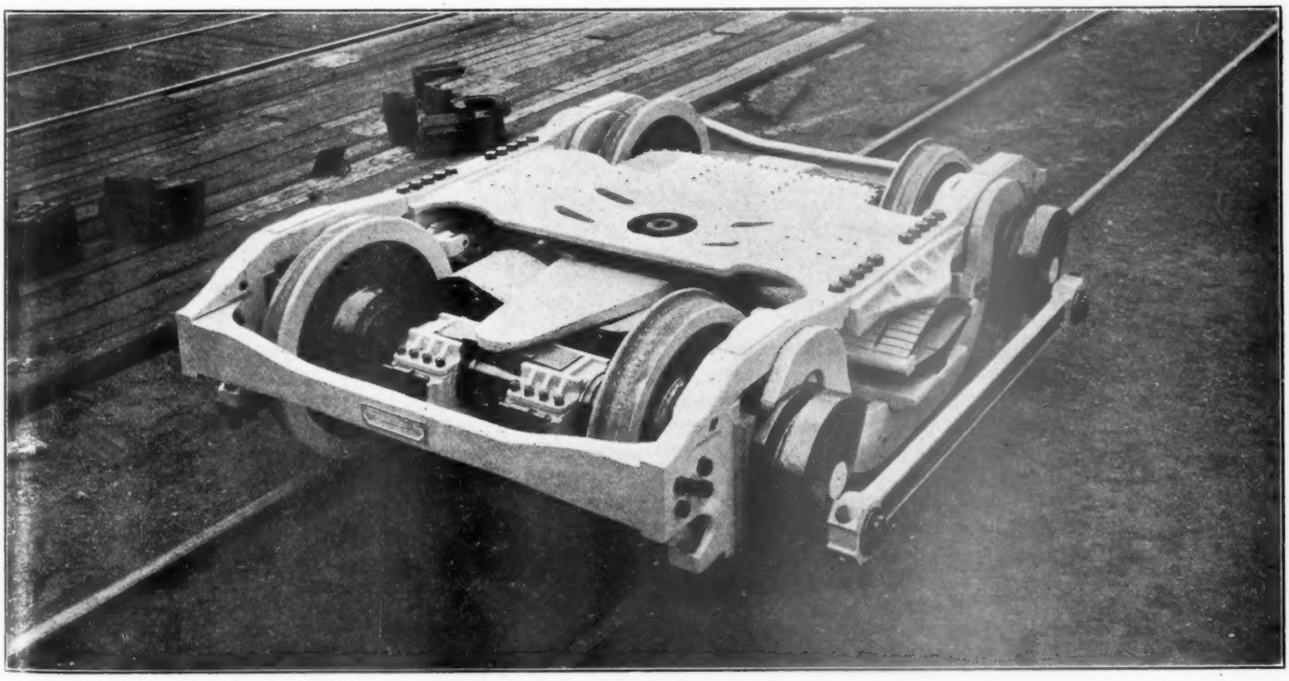
The gears are enclosed in a separate compartment and run in soft grease. The clutch cylinder is separated from the main frame except at the point where it is supported, to prevent the steam from heating the oil which lubricates the booster mechanism. The connecting rods, crossheads and bearings a scoop on the bottom of the connecting rods which lubricates the crank bearings.

No change has been made in the steam supply, which is taken from the main locomotive steam pipes and is controlled by an air-operated valve which is opened or closed by an air



Assembly Drawing of Truck Used with the M. & L. Booster

are lubricated by a splash system. A scoop is attached to the counterweight inside the crank case and as the engine revolves, this throws oil into a pan from which it runs through pipes to the main bearings and the eccentric. There is also valve in the cab. To obtain the necessary flexibility in the steam connections between the engine and tender and also between the tender frame and the booster, Barco joints are used. The steam line from the locomotive to the booster is 3-in. pipe



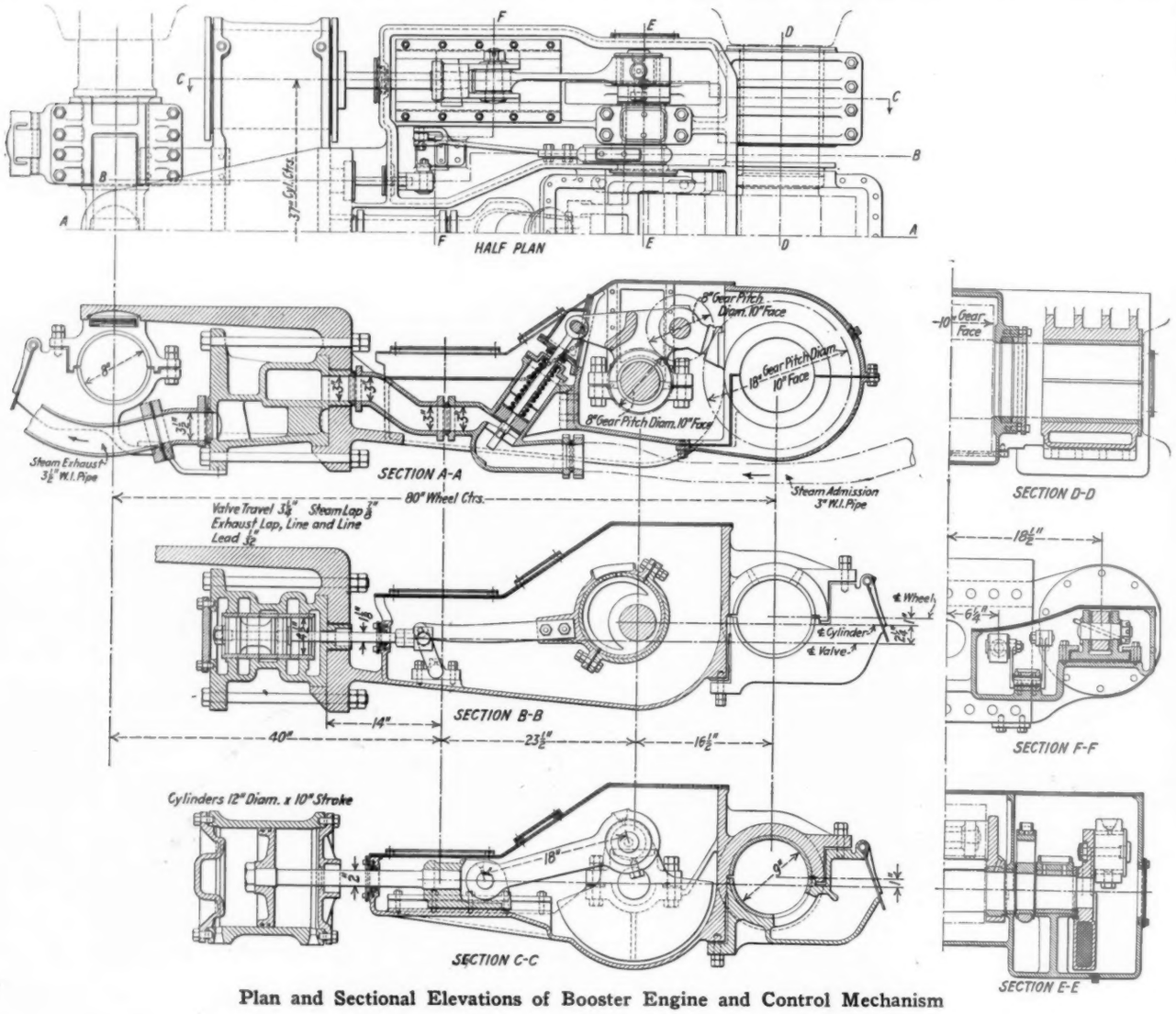
The M. & L. Type B Tender Booster

with a steam trap just ahead of the booster engine. For the exhaust, 3½-in. pipe is used which is curved upward and exhausts into a vertical pipe through the tender tank. Plans are now being made to apply a feedwater heater to utilize the exhaust steam.

One of the principal features of the M & L booster is the simple and positive control mechanism. As will be noted from the drawing, the steam from the locomotive passes to the clutch cylinder before it reaches the booster engine. The steam passages are so arranged that the gears must be in mesh before any considerable amount of steam can reach the booster cylinders. Since the clutch piston controls both the meshing of the gears and the admission of steam to the booster cylinders, the successive operations in throwing the booster into action must necessarily take place in a definite sequence and for that reason the device can be engaged at any reasonable speed without danger of damaging the mechanism. When the steam supply to the booster is shut off, a spring on the upper side of the clutch piston throws the gears out of mesh.

The truck to which the booster is applied is of the pedestal type with a cast steel frame with such modifications as were found desirable to facilitate the booster application. The wheels are 36 in. in diameter with centers 80 in. apart. Power is transmitted from the rear to the front axle by side rods mounted on cranks placed at a radius of 6 in. from the center. The stresses in the side rods are low even at relatively high speed. The forces acting at the crank pin and the centrifugal force at 12 miles per hour cause a combined stress of 5,132 lb. per sq. in. At 60 miles an hour the maximum stress due to centrifugal force alone is 9,100 lb. As the locomotive builder's specifications for side rods call for material with a tensile strength of 90,000 lb. per sq. in. the factor of safety is ample.

The M & L tender booster is intended for use in freight service and is especially valuable on divisions with short ruling grades. It makes it possible to increase the tonnage of freight trains without the expense of reducing grades or strengthening rails and bridges and also eliminates the need for helper engines. Incidental benefits resulting from the use of the tender booster are reduced stresses on draft gear and equipment and more rapid acceleration. It also largely eliminates slipping and consequently reduces rail wear and tire wear. The Delaware & Hudson is planning to apply the tender booster to a considerable number of locomotives. The first to be equipped are Consolidation locomotives with 31,000 lb. tractive force, known in the railroad company's designation as Class E2. These locomotives are used in branch line service and by applying boosters the railroad will be able to increase tonnage on these lines and avoid a large expenditure for stronger bridges which would otherwise be necessary to accomplish the same object.



Plan and Sectional Elevations of Booster Engine and Control Mechanism

High Capacity Ore Cars for the Great Northern

Paying Load Is 81 Per Cent of Gross Weight—Design Includes Many Distinctive Features

THE IRON AND STEEL INDUSTRY of the United States presents a unique transportation problem. The principal iron ore deposits are around Lake Superior, nearly a thousand miles from the Pennsylvania coal fields which produce the best fuel for blast furnaces. To make a ton of iron requires about two tons of Lake Superior ore. It is evident, therefore, that the ore must be transported at low cost to permit iron to be made at a reasonable price. There is probably no better example of the achievement of the American transportation system than the fact that in spite of the handicap of carrying the ore to Lake Superior, loading it into steamers, shipping it to Lake Erie ports, reloading and hauling by rail to the Pittsburgh district, the steel industry of this country can compete for business in the world markets.

A good example of the painstaking attention that is given to and enters into the transportation of ore is found in the design of ore cars. This class of service demands a type of car quite different from that used for coal. Since ore is about three times as heavy as bituminous coal, the cubic capacity for a given weight is very much less. As the lading is dumped directly into the bins at the docks, the cars must be self-cleaning and the length must suit the spacing of the bins.

The Great Northern has recently received from the Pressed Steel Car Company, Pittsburgh, Pa., 750 ore cars of 75 tons capacity which are especially suited for the quick movement of large quantities of ore from the mines to the northern lake ports. While these cars in general are similar to a great many others furnished the northwestern roads for the same purpose, they are built to include the latest improvements and with the inside length, width and height increased to provide additional cubic capacity. The standard length, namely, 24 ft. from pulling face to pulling face of coupler knuckles, has been maintained to suit the ore docks which have pockets 12 ft. wide.

The general dimensions of these cars are as follows:

Inside length of body at top	20 ft. 5 in.
Inside width of body	10 ft. 2½ in.
Width over-all	10 ft. 4 in.
Length over coupler from striking castings	21 ft. 5½ in.

Seventy-Five Ton Ore Cars of Improved Design

Length, pulling face to pulling face of couplers	24 ft. 0 in.
Distance center to center of trucks	15 ft. 2 in.
Height from rail to top of body	10 ft. 2 in.
Length of drop doors in clear	6 ft. 7¼ in.
Width of drop doors in clear	6 ft. 6 in.
Cubic capacity with 30 deg. heap	1,176 cu. ft.
Light weight of car	40,200 lb.

When these cars are loaded to their full axle capacity, the ratio of paying load to gross weight is approximately 81 per cent. This is exceptionally good considering the heavy construction of the car throughout.

From the photograph showing the inside of the car it can readily be seen that the car will discharge the entire load of ore easily and quickly. The sides and ends of the body are very steep, the slope of the end floor being 50 deg. and the side slopes 55 deg. The doors on these cars, which give ample opening, are controlled by the Pressed Steel Car Company's rack door operating device. The design of the mechanism is such that when the doors are closed, the load on the doors is transmitted directly to the car body and does not depend for security on the door operating device. In this way the entire door operating mechanism is relieved of any stress

and is used only for opening and closing the doors. This device includes a clutch arrangement on the door operating shaft, made in such a manner that the operator is relieved of all liability to injury, as the operating shaft is not acted upon by the opening of the doors. After the doors are thrown from their locked position, the operating shaft remains stationary while the doors are being dropped. The time required for opening the doors, discharging the load and again closing the doors is nominal. The average time consumed is shown from actual test to be about 1¼ min.

The underframe is of the usual construction for this type of car. The center sills or draft sills, which are 15 in., 40 lb., channels, extend from the end of the car to the end slope sheet only. They are tied together and to the side sills and bolster construction by a 7/16 in. cover plate extending from side sill to side sill and from the end of the car to the sloping floor. The bolster construction is of the double diaphragm type, made of ⅜-in. material with a 22 in. by ½ in. plate on the bottom. This bolster bottom plate also extends from side to side its full width and is securely riveted to the side sills. The side sills are 12 in., 35 lb. per ft., rolled channels extending from end to end of the car, and are reinforced at the top with a 5/16 in. plate, 19 in. wide, which is flanged on the inside to support the side slope sheets and the hinge butts for the door, the latter forming a brace between the side slope sheet and side sill.

The cover plate on the end of the underframe is formed with a deep flange around the end to form an end sill. This is reinforced at the coupler opening by a heavy steel casting which combines the striking plate and front draft lugs. The coupler carrier iron is removable and is bolted to the striking plate.

The end slope sheets are made of ¼ in. plates and are well braced by angles, being secured to the side construction and to the underframe. The side sheets are made of ¼ in. material, while the side slope sheets are made 5/16 in. thick. The sides are well braced on the inside of the car by pressed steel stakes 5/16 in. thick and on the outside by built-up gussets. The doors, which are made of 5/16 in. material are hinged along the sides and have guard sheets on each end, so that when the doors are dropped the entire load is discharged between the rails, no portion of the lading falling outside of the rails. Each door is provided with four heavy hinges secured to the doors at points reinforced with heavy angle irons. A heavy beam construction made of 5/16 in. material stiffens the doors longitudinally along the inside edge and to these the door operating device is attached. All rivets on the inside of the car in sloped surfaces are flattened so as to reduce the obstructions for the easy dumping of the ore.

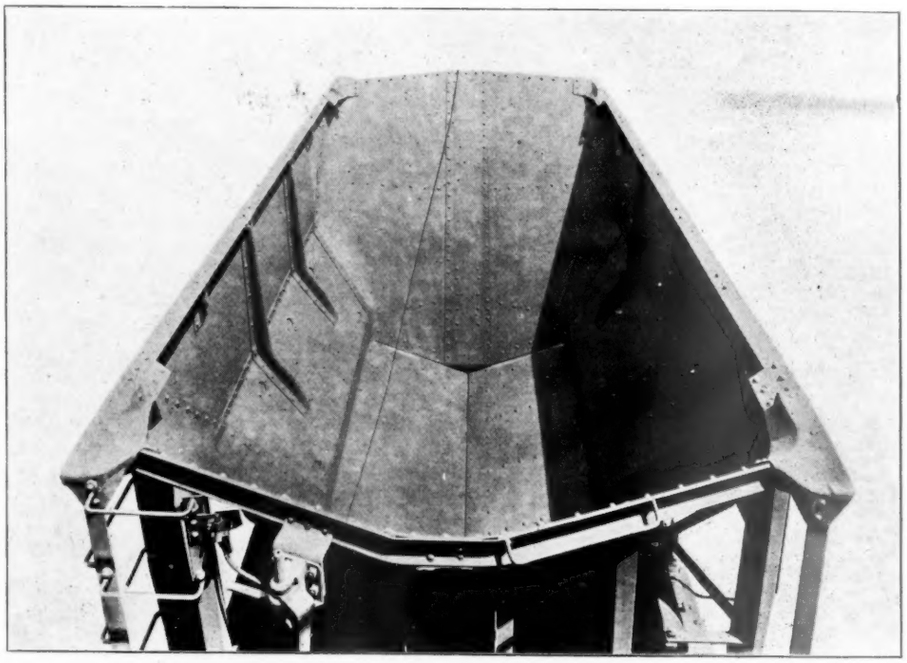
The cars are equipped with Cardwell, type G, Class 20, draft gear and cast steel yokes in conjunction with short shank couplers having the A. R. A. type D head, the coupler shank being 17½ in. long. A short shank coupler is necessary because the trucks must be set as close to the end of the car as practicable to provide the maximum possible space between them for the proper size of body to give the required cubic capacity.

A novel feature of the construction is that the width of the underframe is considerably less than the width of the car. Any ore that is spilled over the side of the car, therefore, falls clear of the underframe instead of being deposited on it to be continually carried around.

Another unusual feature is the method of reinforcing the top of the sides. This is done by means of a heavy angle placed with its legs set at an angle of 45 deg. from the horizontal. With this arrangement there is no horizontal surface around the top of the car on which ore can be deposited and at the same time the heaped capacity of the car is materially increased and the required stiffness is maintained.

The hand brake consists of the Miner Ideal hand lever in conjunction with a set of multiplying gears located at the brake step, the brake chain being connected directly between the push rod and the secondary brake mast.

The truck frames are of the cast steel type with integral boxes, equipped with cast steel bolsters, A.R.A. No. 2 plus brake beams, all for axles having standard 6 in. by 11 in. journals. The chilled iron wheels weigh 865 lb. each.



Interior View, Showing Steep Slope of Sides and Large Door Area

Along Lake Mjösen, Norway

How One Road Recovered from the Shop Strike

C. & A. Shops Show Marked Improvement in Efficiency—Condition of Power Now Better than a Year Ago

ONE OF THE MOST remarkable recoveries which has been effected since the shopmen's strike, called on July 1, 1922, is that of the Chicago & Alton at its principal locomotive shop at Bloomington, Ill. Prior to the strike the output of classified repairs varied from 14 to 18 locomotives a month. Since the strike, the output has gradually been built up until it is now averaging from 24 to 28 locomotives a month and, notwithstanding the fact that on October 1 one-third of this road's locomotives were reported out of service for more than 24 hours, the condition of the power, measured either by the number of locomotives out of service or by the percentage of potential mileage available for service, is better than at the beginning of the strike.

The Bloomington locomotive repair shops of the Chicago & Alton are of the transverse type with 28 pits, two of which are used for stripping and finishing operations and one of which is occupied by cab work, thus leaving 25 working pits. The shop is of comparatively modern construction and well equipped, with all departments, except the blacksmith shop, under one roof. The machine shop occupies two bays, with crane service over the bay adjoining the erecting shop. On the opposite side of the erecting shop the tank and boiler shops are located. This portion of the building is also divided into two bays with crane service over the one adjoining the erecting shop.

TABLE I

CONDITION OF LOCOMOTIVES, MAY 1, 1923, COMPARED WITH MAY 1, 1922.

	Class						
	1	2	3	4	RS	Heavy repairs	Total
MAY 1, 1923							
In service	123	68	48	43	4	..	286
In roundhouses	3	4	3	4	..	..	14
Awaiting disposition	...	..	..	..	..	4	4
In shop	...	..	..	..	..	37	37
Total	126	72	51	47	4	41	341
MAY 1, 1922							
In service	81	70	69	60	2	..	282
In roundhouses	2	5	4	9	..	..	20
Awaiting shop	...	..	..	..	..	12	12
Bloomington Shop	...	..	..	..	..	28	28
Total	83	75	73	69	2	40	342

Following the calling of the shopmen's strike, this shop was practically idle through the months of July, August and September, and at the beginning of October 33.2 per cent of the locomotives owned by the Chicago & Alton were reported out of service. The normal force employed at the locomotive shop prior to the strike numbered approximately 800 men, of which about 150 were machinists and 60 boilermakers. Following the general resumption of operations in October, when a large number of the former employees returned to the service, the force was increased and still remains somewhat above this number, and for about four months a night shift of 14 machinists and 15 boilermakers were employed in order that the accumulation of locomotives requiring heavy repairs might be reduced. Night work, however, was discontinued early this year and the present output is being obtained by the operation of a single shift.

Although the marked improvement which has been effected in shop output and efficiency cannot be attributed directly to the changed attitude of the men employed in the shops since the strike, indirectly this change in attitude has been an important factor in making possible the other improvements which must share in the credit for the increased efficiency of the shop. These other conditions include the installation of a shop scheduling system and the gradual reorganization of the erecting shop force, so that an increasing amount of floor work is being performed by groups of specialists rather than by the pit gangs to which all work on each engine was formerly assigned. Prior to the strike, opposition to these innovations on the part of grievance committees was such as to keep them from serious consideration. To a considerable extent, then, the improvements effected directly by these factors are indirectly the result of the change from an attitude of opposition to all measures advocated by the shop management, to one of willingness to cooperate with the management in its efforts to develop the most effective form of organization and get the most effective results from its operation. One of the evidences of the spirit of cooperation which has been developed between the shop management and the men is found in the fact that the schedule board, generally located in the office of the general foreman or shop superintendent, at the Bloomington shop has been placed on the shop floor near the center of one side of the erecting shop, where it is available for the inspection of all employees. The men frequently avail themselves of the opportunity thus offered to inform themselves as to the status of the schedules their gangs are required to meet.

The Shop Scheduling System

Little need be said as to the details of the shop scheduling system, which, in general, is similar to the scheduling systems in numerous other shops. The outstanding characteristic of the system installed at the Bloomington shop, however, is its simplicity. The schedule board is maintained personally by the general foreman with no addition to the clerical force, and requires from 10 to 15 minutes of his time daily, immediately following the cessation of work in the afternoon. The general foreman notifies the shop superintendent of any failures to meet the schedule and the latter in turn takes the matter up with the foreman responsible for the delay.

The schedule board is rewritten each month and the schedule for each month is made up as near the middle of the preceding month as possible. Should there not be enough locomotives awaiting shop to permit a complete line-up this far in advance, the schedule is made for the first half of the month. The schedules are fixed by the shop superintendent and general foreman on the basis of inspection reports of the locomotives awaiting shopping. Once each week the entire shop situation is discussed by a conference of all the foremen. Such changes in the schedule as are agreed on at these meetings are authorized in writing by the shop superintendent.

TABLE II

BLOOMINGTON SHOP PERFORMANCE, APRIL, 1923, COMPARED WITH APRIL, 1922

	April 1923	April, 1922
Total number of employees in locomotive department	988	728
Total number of machinists	212	154
Total number of boiler makers	88	60
Total man-hours	192,948	158,476
Number of classified repairs completed	24	*14
Man-hours per locomotive out	8,039	11,319

*Two of these locomotives in reality received heavy running repairs.

This simple system, which has been in effect only since the strike, has been the means of effecting complete cooperation between the different departments, has relieved the tendency towards the bunching of work at the end of the

month and has made it possible to maintain a well-balanced organization.

Specialized Work in Erecting Shop

Prior to the strike the erecting shop work was handled by four pit gangs, each organized to perform all floor operations on each locomotive within its jurisdiction. Certain classes of work have now been assigned to groups of specialists who handle this work on all the pits and report directly to the general foreman, and this practice is gradually being extended. One of the most important improvements has been effected by the organization of a stripping gang. Where from four to six days was formerly required to complete the stripping of a locomotive when handled by the pit gangs, this work is now completed in two days ready for the gang foreman to begin actual repairs. This work is now handled by two machinists, two apprentices and three helpers. The heavy crane work is done after shop hours, so that moving engines to and from the repair pits, over the erecting bay causes no interruption of the floor work.

The application of safety valves, air drums, injectors, air reverse gears, etc., ready for the pipe foreman, has now been assigned to one machinist and a helper. Similarly a superheater gang of one machinist and two helpers grind in and applies all superheater units. From two to three hours is now required for the complete application of a set of units, which used to take from 8 to 12 hours in the hands of the pit gang. A truck and trailer gang of three machinists and three helpers has been organized to handle all truck repairs and one machinist and one helper has been assigned to take care of all eccentrics on the power with inside valve motion.

One of the advantages which, it is pointed out, is obtained from this form of organization is the extent to which these special groups plan their own work ahead and keep the general foreman advised as to conditions likely to interfere with the fulfillment of their schedule.

Water Treatment

One of the most notable conditions observed in the Bloomington shops is the unusually large volume of heavy boiler work. Of the 25 locomotives occupying shop pits during the first week in June, one complete new back end and four new inside fireboxes were being applied and the fireboxes of 11 other locomotives were receiving new side sheets. Complete new back ends were also being applied in the boiler shop to the boilers of five locomotives stored outside the shop. In March, 13 sets and in April, 14 sets of side sheets were applied to locomotives turned out in those months.

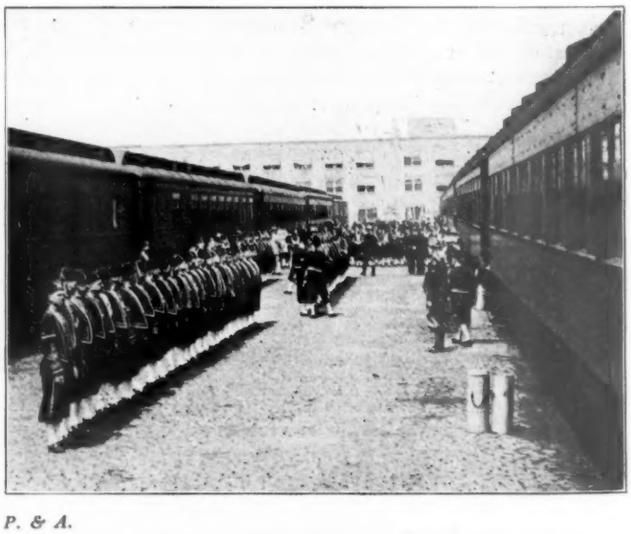
At the beginning of the strike, a good start had been made on a program of water treatment. Since that time the program has been carried to completion, so that, with one or two exceptions, all locomotive feedwater is treated. While this has caused a marked improvement in road conditions, up to the present time it has had little effect on the amount of boiler work in the back shop. The effect is beginning to be felt, however, and it is expected that eventually, when conditions require, that it will be possible, with the decrease in the amount of boiler work, to average two class three repairs from each pit per month.

Present Condition of Power

Reference has already been made to the fact that a material improvement has been made in the average condition of the motive power on the Chicago & Alton since the strike, as compared with the conditions obtaining prior to the strike. In order that a detail comparison may be made it is necessary to consider conditions as of May 1, since complete data are not available for a later period. In the table is shown a summary of the conditions of the motive power on May 1, 1923, as compared with May 1, 1922. It will be seen that there has been a decrease of 22 locomotives in the fourth class, which have made more than 75 per cent of their mileage, a decrease of 22 in the number of locomotives in the third class and an increase of 43 locomotives in first-class condition, which have made less than 25 per cent of their mileage since their last shopping. It will also be seen that on May 1, 1922, there were 60 locomotives out of service in or awaiting shop and in the various roundhouses, or 17.5 per cent of the total number of locomotives on the line, while on May 1, 1923, including four locomotives awaiting A. F. E.'s for final disposition, there were a total of 55 locomotives out of service, or only 16.1 per cent of the total number on the line. Although four locomotives are shown to have completed their mileage and to be ready for the shop, there were no locomotives actually out of service awaiting shopping, and at the present time the difficulty is not one of shop output, but of securing the release from service of a sufficient number of locomotives to properly balance the work in the shops. The improved conditions of the power in service is further reflected by the fact that on May 1, 1923, but 14 locomotives were being held out of service at roundhouses, while a year earlier 20 locomotives were thus detained.

Summarizing the percentage of mileage available for service of all switching, passenger and freight locomotives not undergoing heavy repairs, the average condition of switch engines on May 1, 1923, was 58.7 per cent, as compared with 42.3 per cent on May 1, 1922; the average condition of passenger power was 67.8 per cent on May 1, 1923, and 48 per cent on May 1, 1922, while the average condition of the freight cars was 55.9 and 45 per cent, respectively.

The shop operations in April, 1923, as compared with April, 1922, are also shown in one of the tables. While a larger force was being employed than during the same month last year, a comparison of the man-hours per locomotive repaired shows clearly the marked improvement in efficiency. An exact comparison of the total tractive effort of the locomotives turned out of the shop during the new period is not available, but a rough estimate indicates that the average for the locomotives turned out this year is not more than three or four per cent more than the average of those turned out in 1922. Furthermore, during the past two months the volume of heavy boiler work has been unusually large and all locomotives now being turned out have received repairs equal to or greater than class three. Allowing for these conditions, it is evident that the man-hours comparison is a conservative estimate of the improvement in conditions.



P. & A.

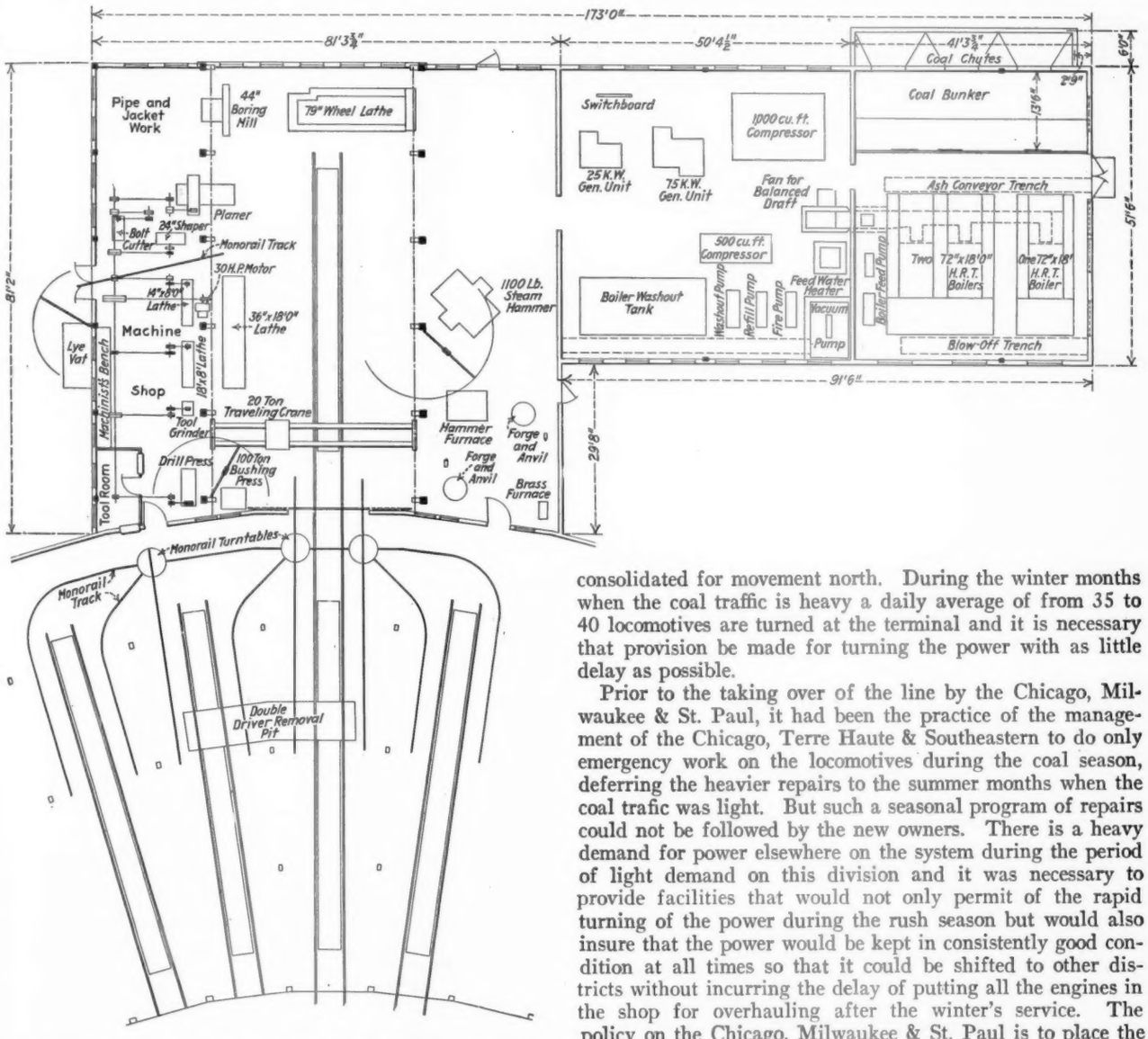
Shriners Forming Beside Their Pullman Dormitories at Their Recent Washington Convention

What a Small Shop Means at Engine Terminal

Results Obtained by the C. M. & St. P. from Well Designed Facilities Installed at West Clinton, Ind.

By H. W. Williams

BY THE INSTALLATION of a small, well equipped machine shop at its West Clinton, Ind., locomotive terminal, the Chicago, Milwaukee & St. Paul more than doubled the output of heavy running repairs during the period of heavy business and added a limited amount of classified repairs with an increase of less than 25 per cent in the number of machinists employed at the terminal. As the utilization of the new facilities is more intensively developed it is expected to still further increase the output until the terminal becomes practically self sustaining so far as heavy running repairs are concerned.



New Shop Layout at West Clinton, Ind.—Monorail Hoist Communicates with the Roundhouse

West Clinton, Ind., is located on what was formerly the Chicago, Terre Haute & South Eastern, which was taken over in July, 1921, and has since been operated as an integral part of the Chicago, Milwaukee & St. Paul. It is located about 20 miles north of Terre Haute, Ind., and it is here that all coal shipments from the Indiana fields served by the line are consolidated for movement north. During the winter months when the coal traffic is heavy a daily average of from 35 to 40 locomotives are turned at the terminal and it is necessary that provision be made for turning the power with as little delay as possible.

Prior to the taking over of the line by the Chicago, Milwaukee & St. Paul, it had been the practice of the management of the Chicago, Terre Haute & Southeastern to do only emergency work on the locomotives during the coal season, deferring the heavier repairs to the summer months when the coal trafic was light. But such a seasonal program of repairs could not be followed by the new owners. There is a heavy demand for power elsewhere on the system during the period of light demand on this division and it was necessary to provide facilities that would not only permit of the rapid turning of the power during the rush season but would also insure that the power would be kept in consistently good condition at all times so that it could be shifted to other districts without incurring the delay of putting all the engines in the shop for overhauling after the winter's service. The policy on the Chicago, Milwaukee & St. Paul is to place the responsibility for the maintenance of the locomotives on the master mechanic under whose jurisdiction they are operating. A locomotive is only sent to the main shops after a long term of service; all repairs necessary in the meantime are made on the division where the engine is operating.

The extent and character of the new shop facilities as well as the size and layout of the terminal are shown in the drawings. Prior to building and equipping the new shop, the three

stalls noted on the terminal layout were occupied by the terminal power plant and the few shop facilities formerly provided. The new shop has therefore, in effect, added three stalls to the roundhouse. As stall space is in demand at this terminal, this in itself is a valuable addition to the terminal facilities.

The new buildings consist of a machine shop and power house. The machine shop is 78 ft. long by 80 ft. wide. Forming an ell on this building is the power house, which is 90 ft. long by 52 ft. wide. As the roundhouse and other terminal buildings were of frame construction, this type was selected for the new buildings. These were erected rapidly and the cost was small in comparison with facilities provided. Construction was started in August and the buildings were completed and the power plant put in operation during the first week in October. Such rapid progress as this could hardly have been made with a structure of brick and steel construction.

A careful study was made of the machinery layout. The machine tools were located with a view not only to the convenience of the roundhouse forces but to serve equally well for the gangs working on a heavy repair job on the shop pit. The shop pit is an extension of one of the engine house drop pit tracks, thus allowing an engine to be pushed directly into the back shop after unwheeling, without being moved over the turntable. This track is located 2 ft. 6 in. off the center of the crane bay to allow space on the machine shop side so that the heavier machines could be located under the crane. A low bay is provided on either side of the crane bay, one to serve as the machine shop and the other as the blacksmith and boiler shop.

One novel feature of the plan is the monorail system, with a Shepard electric hoist of three tons capacity, serving both sides of four roundhouse tracks, including the two drop pit tracks. This provides for the handling of air pumps, side rods and other heavy locomotive parts from the roundhouse pit into the crane bay of the machine shop from which point they can be delivered by the overhead crane to the machine or bench where repairs are to be made.

Just inside the shop on the machine side are located the tools most frequently used by the roundhouse forces. The bushing press is under the crane with the drill press alongside so that rods and boxes can be handled easily to both machines with the swing crane. Just beyond these are the tool grinder and two small lathes with a machinist bench along the wall. The shaper and bolt threader, machines not so frequently used by the house machinists, are farther back in the machine bay and space is available at the extreme end for pipe and jacket work. A spacious tool room is provided in the corner of the machine shop adjoining the roundhouse, where it is convenient both to roundhouse and shop forces.

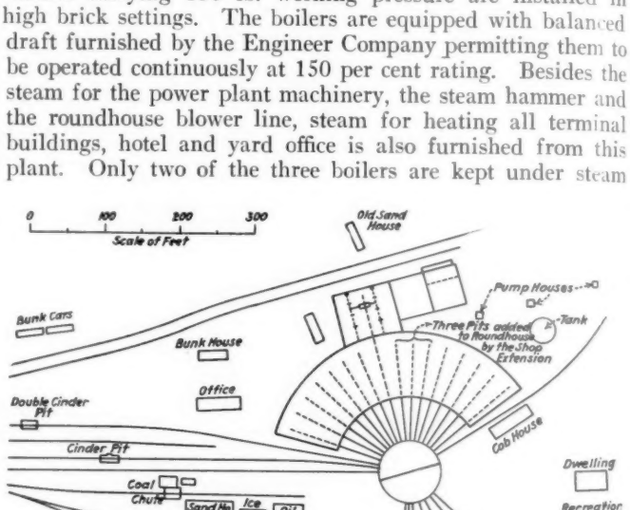
On the machine side of the center or crane bay are ranged a 36-in. engine lathe, a planer and a 44-in. boring mill, so located that work may be delivered to them by the overhead crane. At the extreme end of this bay is located the wheel lathe, so that it can also be served by the crane.

The lye vat is located just outside the building on the machine shop side. A monorail, extending from the crane bay to the outside of the building, delivers parts to a point from which they may be lifted into the vat by means of a conveniently located swing crane.

Just inside the shop building from the engine house on the blacksmith shop side are located the hand forges and the brass furnace. Beyond these is a 1,100-lb. steam hammer served by a swing crane that will reach out into the crane bay and thus eliminate all manual lifting. At the back is the boiler and flue shop. Space for carpenter and electrical work is provided in a small building just outside and adjacent to the machine shop.

The power plant is divided into two rooms. The one next the blacksmith shop is 50 ft. long and forms the engine room. The outer one, which is 40 ft. long, is the boiler room. Coal is delivered to the power house by a locomotive crane with clamshell bucket and stored in bunkers at the firing floor. The ashes are discharged outside by a steam jet ash conveyor.

Three 72-in. by 18-ft., 150-hp. horizontal return tubular boilers carrying 150 lb. working pressure are installed in high brick settings. The boilers are equipped with balanced draft furnished by the Engineer Company permitting them to be operated continuously at 150 per cent rating. Besides the steam for the power plant machinery, the steam hammer and the roundhouse blower line, steam for heating all terminal buildings, hotel and yard office is also furnished from this plant. Only two of the three boilers are kept under steam



West Clinton, Ind., Engine Terminal of the C. M. & St. P., Showing the Location of the New Shop and Power House

for this purpose, allowing one to be held in reserve for repairs and washing. The two boiler feed pumps are located in the boiler room along the partition wall.

In the engine room are located two steam-driven generator units, one of 75-kw. and the other 25-kw. capacity; two steam-driven compressors, one of 1,200 cu. ft. and the other of 500 cu. ft. capacity; the fire, washout and vacuum pumps, the feedwater heater, and the hot water washout plant. The exhaust steam is used for heating the roundhouse and shops.

Prior to the completion of the new back shop the existing shopping facilities were so deficient that it was necessary to assign power that was in first class condition. On this account it is difficult to get a comparison that reflects the advantages that have been gained from the new facilities. It is certain, however, that the division would not have been able to handle as much business as was moved last winter, had these facilities not been provided. This statement is borne out by the fact that only six locomotives were given heavy running repairs during the first three months of 1922, as compared with 14 heavy running and one class three repair during the same period of 1923. During the winter of 1921-22, an average of but two heavy running repairs were turned out per month by a crew of 17 machinists. During the winter of 1922-23 a crew of 21 machinists was employed, with an average output per month of 4 2/3 heavy running repairs and in addition, one class three repair during the three-month period.

That this was possible is unquestionably due in a large measure to the selection of tools as well as the general layout. The wheel lathe has occasioned a real money saving in addition to the great time saving, as it is no longer necessary to ship the wheels to other points for turning, thus eliminating handling them four times. The steam hammer enables the

forces at West Clinton to make up their own heavy forging, whereas formerly this had to be done at Bedford, Ind., the principal shop on the C. T. H. & S. E. Line, with the handling and delay incident thereto. The crane has also proved a great labor saver. By its use it is possible to replace a cross compound air pump in 30 minutes with less men than were formerly required to do the same job working four to five hours with a block and falls. This performance is duplicated in numerous other operations, such as handling wheels to and from the lathe, handling domes, back ends, side rods, etc.

A particularly noticeable improvement has been brought about through the new power plant installation. Formerly there was a continuous shortage of steam for operating the compressors and generator. The natural result was that some operations had to be delayed to leave sufficient air for other more pressing needs. The car department suffered especially from this condition as it is located at some distance from the roundhouse, and for a considerable portion of the time the air pressure was too low for the air tools to be used.

While the operation during the past winter has fully justified the decision to construct a small back shop at West Clinton, an even greater showing is expected for the entire year. Much more of the power on the division will require heavy repairs than has been the case up to the present time, thus making for a more intensive, hence more efficient operation. It is expected to turn out a minimum of six engines for heavy running repairs and, except for the months of heavy traffic, one classified repair per month, in addition to the usual amount of lighter running repairs.

Improved Equipment Condition Assists Operation

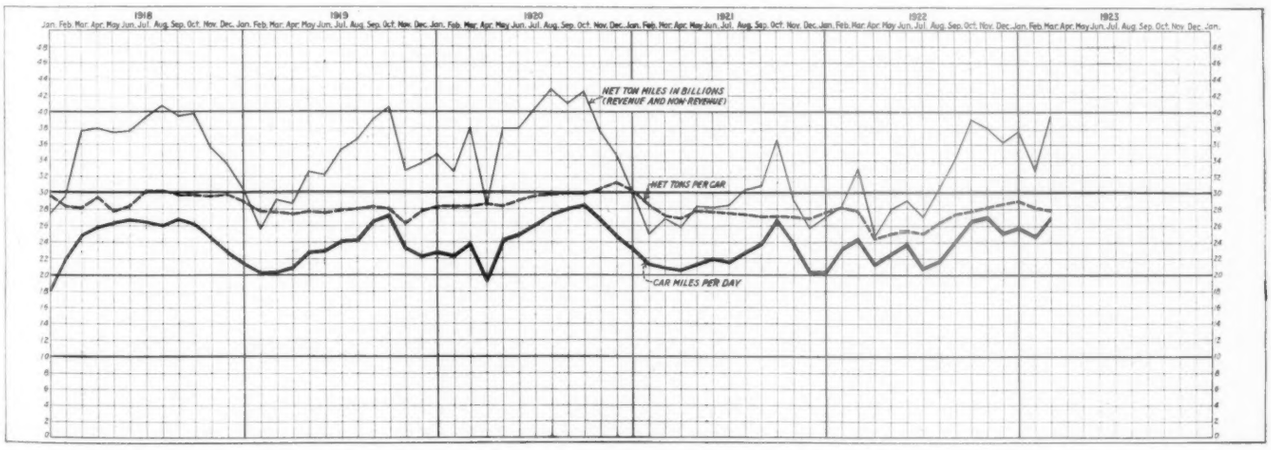
Present Efficiency in Marked Contrast with Last Fall—Decrease in Equipment in 1920 and 1921

THE MOST NOTEWORTHY feature of railroad operating conditions at this time is the smooth functioning of the transportation machine in spite of the record volume of traffic.

Revenue car loadings for the week ended May 26 totaled 1,014,029. In the preceding week, that ending May 19, loadings totaled 991,797. During the period, May 15 to 22, there was reported a car shortage of 20,585 and a surplus of 22,700—the first time since last August, that there has been a net surplus of cars. The revenue car loadings for the week ended May 26 were only about 400 less than those reported for the week ended October 28, 1922. They were about 4,000 less than the record figure reached for one week in October, 1920. The most interesting feature of the situation is the marked contrast as between the situation in May and of last October. Whereas with the heavy loadings in April and May there has been for the past few weeks a small net shortage and more recently, actually a net surplus, last October there was a very severe shortage which, for the period ended October 30, averaged 179,239 cars.

There is unquestionably more than one reason for the big improvement in the railway operating situation which has been effected in the period which spans the months from October, 1922, to June, 1923. One of the outstanding features, however, is the great improvement which has been made in the equipment situation, notably with reference to locomotives. Last October the railways were in the midst of the struggle attendant upon the railway shopmen's strike. Even those roads that settled under the Willard-Warfield agreement in September had hardly restored operations in their shops to an extent sufficient to remedy the deterioration of their power which had resulted from the operation of their repair facilities with only skeleton forces for a period approximating 2½ months. On October 1 the railroads had 16,313 locomotives held for repairs requiring over 24 hrs. equivalent to 25.3 per cent of their total locomotives on line while on May 15 the number held for repairs requiring over 24 hrs. had been brought down to 12,183, 19 per cent of the total. Further than that, the locomotives held for repairs requiring less than 24 hrs., which on October 1 were 5.3 per cent, had been reduced on May 15 to but 2 per cent. Whereas on October 1, the number of locomotives serviceable was but 44,703, on May 15 it was 50,587, the largest number of locomotives in serviceable condition to be reported since the locomotive condition reports were originated by the Car Service Division.

The car situation figures reflect the effect of the shopmen's strike less than do those applying to locomotives.



Daily Car Mileage is Near the High Record; Net Tons Per Car Lower than in 1918 or 1920

Throughout most of the first three-quarters of 1922, bad order cars on the Class I railroads averaged roughly between 14½ and 15 per cent of the total cars on line. On May 15, the figure was 9.3 per cent, which means that the railroads now have more cars serviceable than they had last October, just as they have a larger available supply of power.

The American Railway Association program is that the percentage of locomotives held for heavy repairs should be reduced to 15 per cent by October 1 and it has set as a goal a reduction in the percentage of bad order cars to 5. Upon the accomplishment of these goals will rest the degree of efficiency with which the railroads will handle the business offered to them throughout the summer and the fall.

IN 1920, WEEKLY CAR LOADINGS IN OCTOBER GREATER THAN IN AUGUST BUT NET AND REVENUE TON-MILES WERE LESS

Week ended	Revenue car loadings	Date	Net car shortage	Net ton-miles thousands (for month)	Revenue ton-miles thousands (for month)	Reserve tons thousands (for month)
August Traffic						
Aug. 6	935,730	Aug. 8	123,109			
Aug. 13	971,269	Aug. 15	123,993			
Aug. 20	968,103	Aug. 23	140,504	42,734,000	39,185,301	211,357
Aug. 27	1,001,308	Sept. 1	151,223			
Sept. 2	961,633	Sept. 8	109,408			
October Traffic Compared						
Oct. 8	1,011,666	Oct. 8	79,194			
Oct. 15	1,018,539	Oct. 15	72,551			
Oct. 22	1,008,818	Oct. 23	68,120	42,570,000	39,101,098	213,383
Oct. 29	981,242	Nov. 1	55,856			
Nov. 5	915,615	Nov. 8	31,847			

Car Loadings and Revenue Ton-Miles

There happen to be available three figures which permit one to check the volume of traffic, these being the revenue car loadings, the net ton-miles and the revenue ton-miles. The car loadings figures are a more recent development than the other two and they have not yet received sufficient attention and study so that one can be sure of the relationship which may exist between them and the other two units. It is of interest in this connection that in October, 1922, there were two weeks in which the car loadings exceeded 1,000,000 cars. The net ton-miles for the month totaled 39,260,000,000. The best week in March, 1923, was that ended March 31 and the car loadings in that week totaled only 938,725. In none of the other weeks during the month did the loadings exceed 920,000 and in two of the weeks they were nearer 905,000. Nevertheless, the net ton-miles for the month were 39,218,000,000. In other words, in spite of the fact that the figure of traffic handled as expressed in loadings was very much less in March, 1923, than in October, 1922, the amount of traffic handled as expressed in net ton-miles was only slightly less. It is somewhat difficult to explain the reason for this state of affairs, but it is apparent that the business handled in October was either that in commodities which loaded less heavily per car or else moved a shorter distance than did the business handled in March.

The business in May, 1923, was probably more like that handled in March, 1923, than that moved in October, 1922. In other words, the fact that the average loadings per week in April were greater than in March and in May greater than in either April or March, is significant because it is apparent that the traffic as expressed in net ton-miles or in revenue ton-miles in May will very likely match or, at least, come close to matching the peak figures reported in August, 1920, when the net ton-miles of the Class I railroads were 42,734,000,000, and the revenue ton-miles, 39,185,301,000. The fact that the business is being handled with practically no car shortage is the outstanding feature because in August, 1920, there was a net shortage of cars which finally for the period ended September 2, reached a figure of 151,223. We shall have to wait a few more weeks to determine whether the May ton-miles figures may or may not have exceeded the August, 1920, totals, but whether they exceed them or not they will have approached them closely enough to indicate beyond any question the degree of efficiency which the railroads have succeeded in bringing into their operations since they began last fall finally to overcome the effect of the railway shopmen's strike.

WEEKLY CAR LOADINGS IN MARCH, 1923, WERE MUCH LESS THAN IN OCTOBER, 1922, BUT NET AND REVENUE TON-MILES ONLY SLIGHTLY LESS

Week ended	Revenue car loadings	Date	Surplus	Shortage	Net ton-miles thousands (for month)	Revenue ton-miles thousands (for month)	Revenue tons thousands (for month)
October, 1922, Traffic							
Oct. 7	968,169	Oct. 8	5,500	141,252			
Oct. 14	983,470	Oct. 15	4,275	156,309			
Oct. 21	1,003,759	Oct. 23	4,409	166,349	39,260,000	35,987,000	193,349
Oct. 28	1,014,480	Oct. 30	....	179,239			
Nov. 4	994,827	Nov. 8	4,990	174,498			
March, 1923, Traffic Compared							
Mar. 3	917,896	Mar. 7	13,229	79,270			
Mar. 10	905,219	Mar. 14	12,461	74,442			
Mar. 17	904,286	Mar. 22	12,741	71,443	39,218,000	35,273,546	188,303
Mar. 24	917,036	Mar. 31	14,196	68,986			
Mar. 31	938,725						

A Net Surplus

Another point in this connection relates to the surplus or shortage of cars. Of course, it is now generally understood that when we have a car shortage, it does not mean necessarily that there is an actual shortage of cars, so much as the fact that there is a shortage of transportation. In other words, when car shortages are being reported it means that the traffic is not being handled with its usual dispatch and as a result the railways are not in a position to supply cars promptly at the places where they are needed, or able, on the other hand, to deliver the shipments with that promptness which is desirable. A car shortage, in other words, may be due less to a shortage of cars than to a shortage of motive power or yards and terminals, to a lack of proper operating efficiency or, more likely, to a combination of several of these elements.

The impression from noting the increase in the car loadings figures which has taken place since last October and the manner in which the loadings have held up recently is that the peak of the year's business is still ahead of us and may not have been reached in May. It will not necessarily follow that the peak for the year will come in October.

LOCOMOTIVE EQUIPMENT CONDITION ON SELECTED DATES

Road and district	No. locos. on line January 1, 1923	July 1, 1922		October 1, 1922		January 1, 1923		May 15, 1923	
		Per cent req. repairs over 24 hrs.	No. serviceable stored	Per cent req. repairs over 24 hrs.	No. serviceable stored	Per cent req. repairs over 24 hrs.	No. serviceable stored	Per cent req. repairs over 24 hrs.	No. serviceable stored
Eastern District—									
Group A:									
Boston & Albany	352	15.3	...	16.7	...	13.9	...	14.7	...
Boston & Maine	1,134	20.6	60	27.0	36	23.2	...	27.3	...
Central Vermont	116	20.4	10	20.4	7	20.7	2	18.2	...
Maine Central	256	7.4	6	16.0	2	14.1	1	12.9	1
New York, New Haven & Hartford	1,151	17.7	103	29.3	27	28.8	7	25.4	...
Total (7 roads)	3,179	17.4	189	25.1	76	23.2	13	23.3	4
Group B:									
Buffalo, Rochester & Pittsburgh	290	8.1	61	10.9	3	5.2	...	9.1	14
Delaware & Hudson	483	8.5	193	20.0	40	16.4	13	17.6	14
Delaware, Lackawanna & Western	793	14.4	78	22.7	3	23.7	...	16.7	...
Erie	1,579	22.8	168	37.6	18	26.0	13	17.2	118
Lehigh Valley	1,018	14.9	302	31.1	53	34.6	8	30.0	11
New York Central	3,596	27.8	529	37.3	25	24.4	11	20.7	234
New York, Ontario & Western	195	27.8	529	24.6	...	29.2	...	28.4	...
Total (13 roads)	8,176	21.7	1,388	32.6	160	24.9	58	20.4	413
Group C:									
Chic., Ind. & Louisville	150	18.4	6	27.0	...	14.0	...	12.7	...
Cleve., Cincin., Chic. & St. Louis	894	23.3	21	33.2	1	23.3	...	16.1	15
Grand Trunk Western	325	16.9	33	17.8	24	17.8	6	15.0	...
Hocking Valley	167	27.1	22	37.7	...	30.5	...	28.0	3
Lake Erie & Western	145	31.8	23	31.7	2	28.3	...	23.0	5
Michigan Central	779	15.6	133	19.0	62	15.5	23	14.4	21
New York, Chicago & St Louis	250	15.0	37	13.7	22	21.2	10	22.9	4
Pere Marquette	443	9.2	31	16.6	3	12.4	2	13.7	3
Pittsburgh & Lake Erie	319	17.2	67	19.7	9	12.5	3	12.5	...
Wabash	619	9.3	48	19.1	8	17.9	...	23.5	3
Wheeling & Lake Erie	229	49.8	...	56.6	...	51.1	...	36.2	...
Total (19 roads)	4,717	18.3	537	24.7	144	20.1	49	18.5	62
Grand total, Eastern District	16,072	19.8	2,114	28.7	380	23.2	120	20.4	479
Allegheny District—									
Baltimore & Ohio	2,613	26.7	195	44.6	5	28.6	37	21.3	18
Bessemer & Lake Erie	197	24.9	27	22.8	9	39.1	16	32.5	1
Central of New Jersey	564	13.1	94	22.6	19	25.0	5	28.0	1
Long Island	178	14.0	5	23.2	...	19.1	...	20.6	...
Pennsylvania System	7,249	19.7	1,020	23.0	78	19.7	25	16.8	16
Philadelphia & Reading	1,104	12.2	275	12.8	135	12.7	11	14.0	72
Union	163	9.2	24	7.4	151	13.5	7	21.7	...
Western Maryland	302	35.1	34	29.5	8	26.5	2	25.7	11
Total (11 roads)	12,510	20.4	1,704	26.4	418	21.5	106	18.5	127
Pocahontas District—									
Chesapeake & Ohio	939	12.8	58	30.1	34	18.5	23	15.9	1
Norfolk & Western	1,075	5.2	172	13.8	100	12.3	...	18.1	...
Virginian	146	8.2	...	17.1	...	8.2	...	9.6	...
Total (3 roads)	2,160	8.7	230	21.1	134	14.7	23	16.5	1
Southern District—									
Group A:									
Atlantic Coast Line	851	13.1	36	19.7	29	14.5	1	15.3	2
Norfolk Southern	113	24.1	...	26.5	...	26.5	...	21.4	...
Seaboard Air Line	580	27.3	...	28.4	...	21.6	...	15.0	...
Southern Ry.	2,211	15.3	31	27.2	4	18.8	2	16.4	3
Total (7 roads)	3,974	16.8	81	25.5	42	18.1	5	15.8	6
Group B:									
Central of Georgia	298	9.6	...	15.5	...	9.7	...	11.4	3
Florida East Coast	131	15.1	37	17.6	36	13.0	15	11.5	17
Illinois Central	1,733	18.5	24	15.6	...	15.4	...	13.7	...
Louisville & Nashville	1,278	8.7	3	22.0	...	18.9	...	14.8	...
Mobile & Ohio	249	23.5	5	31.5	2	22.9	2	15.1	...
Nash., Chattanooga & St. Louis	276	20.2	3	22.0	2	15.2	2	19.3	3
Total (19 roads)	4,528	15.2	76	20.2	45	17.0	19	14.8	23
Grand total, Southern District	8,502	16.0	157	22.7	87	17.5	24	15.3	29
Northwestern District—									
Chicago & North Western	2,055	17.3	106	31.0	2	19.7	...	16.9	...
Chicago Great Western	275	16.5	28	27.2	1	25.1	...	14.9	16
Chicago, Milwaukee & St. Paul	1,988	17.9	100	23.6	32	17.1	29	15.7	43
Chicago, St. Paul, Minn. & Omaha	406	16.3	15	25.9	1	24.9	2	18.8	13
Duluth & Iron Range	103	32.1	1	31.5	1	39.8	14	19.1	1
Duluth, Missabe & Northern	116	17.6	7	25.6	15	31.9	35	21.2	10
Elgin, Joliet & Eastern	265	11.8	31	16.2	29	10.9	8	11.9	...
Great Northern	1,414	17.0	228	23.6	46	23.5	36	26.6	70
Minneapolis & St. Louis	226	18.1	14	25.2	...	22.1	...	21.2	...
Minn., St. Paul & S. S. Marie	534	11.9	18	17.0	4	23.6	2	16.7	9
Northern Pacific	1,421	16.6	129	18.8	88	18.5	32	21.5	41
Total (16 roads)	9,024	16.6	129	24.3	230	20.4	159	19.0	203
Central Western District—									
Atchison, Topeka & Santa Fe	2,095	10.8	287	15.2	58	17.5	25	15.0	99
Chicago & Alton	340	20.8	16	33.2	...	16.2	...	16.8	10
Chicago & Eastern Ill.	354	22.1	48	38.2	16	34.5	...	25.1	15
Chicago, Burl. & Quincy	1,979	16.4	151	20.5	4	16.0	11	19.3	4
Colorado & Southern	159	23.4	7	26.5	1	23.9	5	25.9	8
Chicago, Terre Haute & So. Eastern	110	25.0	30	17.8	...	11.8	...	17.9	...
Chicago, Rock Island & Pacific	1,613	11.4	70	23.1	15	20.4	5	20.3	2
Denver & Rio Grande Western	579	26.7	49	34.3	3	29.9	1	27.4	16
El Paso & Southwestern	152	11.5	27	23.6	27	21.1	14	19.2	13
Fort Worth & Denver City	115	16.7	...	35.2	...	30.4	...	25.2	...
Los Angeles & Salt Lake	189	11.2	7	20.2	1	18.5	...	(1)	(1)
Southern Pacific Lines	1,546	12.4	44	15.6	9	18.0	13	17.0	35
Union Pacific	1,692	15.8	284	18.8	42	18.9	19	21.6	145
Western Pacific	139	18.7	18	19.4	...	18.0	8	20.9	11
Total (20 roads)	11,327	15.2	1,059	21.3	178	19.7	104	19.5	363

[1]Figures now included with Union Pacific.

Road and district	No. locos. on line January 1, 1923	July 1, 1922		October 1, 1922		January 1, 1923		May 15, 1923	
		Per cent req. repairs over 24 hrs.	No. serviceable stored	Per cent req. repairs over 24 hrs.	No. serviceable stored	Per cent req. repairs over 24 hrs.	No. serviceable stored	Per cent req. repairs over 24 hrs.	No. serviceable stored
Southwestern District—									
Gulf Coast Lines	107	17.0	12	30.0	...	12.1	...	20.2	...
International-Great Northern	182	15.6	41	24.2	16	18.7	29	21.4	29
Kansas City Southern	186	8.6	24	24.2	7	18.8	...	17.2	5
Missouri-Kansas-Texas	683	14.6	140	36.0	25	33.2	6	27.1	80
Missouri Pacific	1,147	16.4	9	27.5	...	26.4	...	25.8	...
St. Louis-San Francisco	939	13.7	16	31.1	...	28.0	...	20.7	12
St. Louis Southwestern	276	11.1	48	25.8	9	25.4	2	17.1	6
So. Pacific (Tex. & La.)	549	22.5	34	26.4	3	24.2	1	(2)	(2)
Texas & Pacific	365	18.1	36	26.4	10	29.3	...	22.4	25
Total (18 roads)	365	18.1	36	29.5	74	26.7	40	22.7	174
Grand total, western districts	25,209	16.1	2,127	23.9	482	21.3	303	19.9	740
Grand total, all districts	64,453	17.3	6,332	25.3	1,501	21.1	576	19.0	1,376

[2]Figures for Texas & Louisiana Lines now included with Southern Pacific System.

FREIGHT CARS IN BAD ORDER, CLASS I ROADS

Road and district	Total cars on line	June 1, 1922 Cars awaiting repairs			Per cent to total on line	Total cars on line	May 15, 1923 Cars awaiting repairs			Per cent to total on line
		Light	Heavy	Total			Light	Heavy	Total	
Eastern District—Group A										
Boston & Albany	8,173	105	627	732	9.0	9,876	157	187	344	3.5
Boston & Maine	29,328	644	4,831	5,475	18.7	38,767	572	2,936	3,508	9.0
Central Vermont	3,049	163	833	996	32.7	3,826	28	298	326	8.5
Maine Central	7,844	186	292	478	6.1	8,773	339	116	455	5.2
New York, New Haven & Hartford	40,514	858	11,109	11,967	29.5	48,567	968	7,637	8,605	17.7
Total (7 roads)	94,768	2,129	19,126	21,255	22.4	116,192	2,375	11,435	13,810	11.8
Group B—										
Buffalo, Rochester & Pittsburgh	14,731	1,107	1,744	2,851	19.4	10,646	355	821	1,176	11.0
Delaware & Hudson	15,590	200	1,106	1,306	8.4	17,855	333	1,070	1,403	7.9
Delaware, Lackawanna & Western	23,914	534	2,305	2,839	11.9	24,610	587	432	1,019	4.1
Erie	56,018	2,015	7,977	9,992	17.8	53,847	679	4,401	5,080	9.4
Lehigh Valley	39,958	764	3,957	4,721	11.8	34,928	303	1,621	1,924	5.5
New York Central	118,758	4,763	19,195	23,958	20.2	155,125	4,803	10,902	15,705	10.1
New York, Ontario & Western	6,262	99	416	515	8.2	5,684	187	467	654	11.5
Total (13 roads)	285,898	10,174	39,218	49,392	17.3	311,078	7,411	20,934	28,345	9.1
Group C—										
Chicago, Indianapolis & Louisville	6,815	147	1,203	1,350	19.8	8,284	105	1,219	1,324	16.0
Cleveland, Cincinnati, Chicago & St. Louis	34,513	803	5,334	6,137	17.8	31,711	709	2,212	2,921	9.2
Grand Trunk Western	11,019	235	804	1,039	9.4	14,741	406	727	1,133	7.7
Hocking Valley	14,359	649	3,671	4,320	30.1	14,399	576	4,402	4,978	34.6
Lake Erie & Western	5,215	65	1,347	1,412	27.1	4,207	47	403	450	10.7
Michigan Central	26,575	869	4,473	5,342	20.1	30,552	1,291	992	2,283	7.5
New York, Chicago & St. Louis	8,771	299	503	802	9.1	9,523	278	552	830	8.7
Pere Marquette	20,027	148	2,446	2,594	13.0	25,464	359	767	1,126	4.4
Pittsburgh & Lake Erie	31,165	2,344	8,459	10,803	34.7	21,288	1,216	2,628	3,844	18.1
Wabash	19,703	234	2,412	2,646	13.4	18,108	75	615	690	3.8
Wheeling & Lake Erie	8,533	185	519	704	8.3	9,979	218	412	630	6.3
Total (19 roads)	217,650	7,081	35,947	43,028	19.8	204,502	5,574	16,206	21,780	10.7
Grand total, Eastern District	598,326	19,384	94,291	113,675	79.0	631,772	15,360	48,575	63,935	10.1
Allegheny District—										
Baltimore & Ohio	99,450	2,568	12,818	15,386	15.5	96,989	1,309	4,515	5,824	6.0
Bessemer & Lake Erie	13,244	81	1,641	1,722	13.0	10,226	346	1,919	2,265	22.1
Central of New Jersey	28,122	379	1,406	1,785	6.3	24,992	394	2,632	3,026	12.1
Long Island	4,971	52	191	243	4.9	7,613	61	150	211	2.8
Pennsylvania System	269,315	4,994	31,058	36,052	13.4	256,683	3,807	11,574	15,381	6.0
Philadelphia & Reading	40,707	367	1,606	1,973	4.8	40,159	333	1,303	1,636	4.1
Union	6,651	151	117	268	4.0	7,554	316	200	516	6.8
Western Maryland	13,450	58	1,912	1,970	14.6	12,147	145	2,123	2,268	18.7
Total (11 roads)	483,529	8,926	51,777	60,703	12.5	458,625	6,784	24,673	31,457	6.9
Pocahontas District—										
Chesapeake & Ohio	50,613	885	6,495	7,380	14.6	41,868	2,357	2,111	4,468	10.7
Norfolk & Western	39,517	1,391	1,286	2,677	6.8	36,876	613	1,352	1,965	5.3
Virginian	9,315	134	830	964	10.3	8,414	75	202	277	3.3
Total (3 roads)	99,445	2,410	8,611	11,021	11.1	87,158	3,045	3,665	6,710	7.7
Southern District—Group A										
Atlantic Coast Line	27,467	437	4,303	4,740	17.3	29,185	501	1,711	2,212	7.6
Norfolk Southern	3,799	88	834	922	24.3	4,132	219	668	887	21.5
Seaboard Air Line	21,770	1,125	6,149	7,274	33.4	20,788	173	4,313	4,486	21.6
Southern Railway	74,181	3,439	10,547	13,986	18.9	78,515	448	6,397	6,845	8.7
Total (7 roads)	135,165	5,732	23,305	29,037	21.4	142,603	1,585	14,254	15,839	11.1
Group B—										
Central of Georgia	6,910	27	1,245	1,272	18.4	8,004	34	408	442	5.5
Florida East Coast	2,694	51	186	237	8.8	3,253	79	210	289	8.9
Illinois Central	58,849	2,475	5,381	7,856	13.3	67,043	1,884	2,826	4,710	7.0
Louisville & Nashville	51,291	1,524	4,868	6,392	12.5	46,873	1,428	5,950	7,378	15.7
Mobile & Ohio	8,258	340	3,292	3,632	44.0	8,252	336	798	1,134	13.7
Nashville, Chattanooga & St. Louis	7,650	321	1,666	1,987	26.0	7,311	232	393	625	8.5
Total (19 roads)	151,977	5,020	21,029	26,049	17.1	156,892	4,288	12,196	16,484	10.5
Grand Total, Southern District	287,142	10,752	44,334	55,086	19.1	299,495	5,873	26,450	32,323	10.8
Northwestern District—										
Chicago & Northwestern	66,910	3,321	2,825	6,146	9.2	71,781	2,867	2,494	5,361	7.5
Chicago Great Western	10,804	90	2,363	2,453	22.7	8,050	72	799	871	10.8
Chicago, Milwaukee & St. Paul	64,989	1,192	9,083	10,275	15.8	67,246	864	4,627	5,491	8.2
Chicago, St. Paul, Minn. & Omaha	13,271	645	1,043	1,688	12.7	11,045	574	660	1,234	11.2
Duluth & Iron Range	6,737	148	518	666	9.9	6,654	264	34	298	4.5
Duluth, Missabe & Northern	9,407	18	6	24	.3	9,336	127	12	139	1.5
Elgin, Joliet & Eastern	14,776	289	1,042	1,331	9.0	15,526	327	517	844	5.4
Great Northern	49,330	3,987	3,815	7,802	15.8	48,175	2,358	2,083	4,441	9.2
Minneapolis & St. Louis	9,451	178	2,387	2,565	17.1	7,442	256	1,114	1,370	18.4
Minn., St. Paul & S. S. Marie	23,431	967	1,445	2,412	10.3	23,378	750	1,238	1,988	8.5
Northern Pacific	41,287	2,042	2,644	4,686	11.3	37,203	1,507	2,734	4,241	11.4
Total (16 roads)	318,007	13,007	27,934	40,941	12.9	313,903	10,168	16,669	26,837	8.5

Road and district	June 1, 1922 Total cars on line	Cars awaiting repairs Light	Heavy	Total	Per cent to total on line	May 15, 1923 Total cars on line	Cars awaiting repairs Light	Heavy	Total	Per cent to total on line
Central Western District—										
Atchison, Topeka & Santa Fe	64,607	2,052	3,875	5,927	9.2	62,770	1,698	3,496	5,194	8.3
Chicago & Alton	12.681	176	446	622	4.9	13,154	229	705	934	7.1
Chicago & Eastern Illinois	21,598	887	2,658	3,545	16.4	15,671	489	2,958	3,447	22.0
Chicago, Burlington & Quincy	63,945	3,153	4,501	7,654	12.0	65,277	2,047	4,323	6,370	9.8
Colorado & Southern	6,182	210	415	625	10.1	5,056	73	150	223	4.4
Chicago, Terre Haute & South Eastern	5,117	344	1,523	1,867	36.5	6,718	80	1,034	1,114	16.6
Chicago, Rock Island & Pacific	44,036	1,164	3,270	4,434	10.1	37,137	1,867	3,779	5,646	15.2
Denver & Rio Grande Western	12,930	491	873	1,364	10.5	11,107	301	701	1,002	9.0
El Paso & Southwestern	4.028	95	291	386	9.6	3,373	94	56	150	4.4
Fort Worth & Denver City	3,561	264	907	1,171	32.9	2,522	55	333	388	15.4
Southern Pacific Lines	33 061	423	1,952	2,375	7.2	52,257	698	1,982	2,680	5.1
Union Pacific	44.081	2,464	3,821	6,285	14.3	43,683	2,760	2,268	5,028	11.5
Western Pacific	5 037	129	29	158	3.1	4,154	169	42	211	5.1
Total (20 roads)	331.361	12,155	26,250	38,405	11.6	330,820	10,716	23,452	34,168	10.3
Southwestern District—										
Gulf Coast Lines	3.542	42	430	472	13.3	3,610	17	132	149	4.1
International-Great Northern	5.396	139	936	1,075	20.0	4,874	72	634	706	14.5
Kansas City Southern	4,665	128	382	510	10.9	4,689	34	288	322	6.9
Missouri-Kansas-Texas	20,386	336	1,188	1,524	7.5	18,001	271	1,646	1,917	10.6
Missouri Pacific	43.061	1,744	3,099	4,843	11.2	41,719	1,490	2,764	4,254	10.2
St. Louis-San Francisco	30,766	1,037	1,475	2,512	8.2	29,140	644	2,031	2,675	9.2
St. Louis Southwestern	10,114	438	2,808	3,246	32.1	8,945	248	1,010	1,258	14.1
Southern Pacific (Tex. & La.)	16,305	194	1,614	1,808	11.1	(1)	(1)	(1)	(1)	(1)
Texas & Pacific	9,233	131	1,966	2,097	22.7	8,059	130	873	1,003	12.4
Total (18 roads)	156,114	4,576	16,415	20,991	13.4	130,040	3,036	11,777	14,813	11.4
Grand Total Western Districts	805,482	29,738	70.599	100,337	12.5	774,763	23,920	51,898	75,818	9.8
Grand Total all Districts	2,273,924	71,210	269,612	340,822	15.0	2,251,813	54,982	155,261	210,243	9.3

[1]Now included in Southern Pacific System.

As a matter of fact, the peak of the year's business only comes in October about half the time. There is also the point that the October business, if the situation in 1920 or 1922 is any criterion, is in commodities which load fewer tons to a car or travel a shorter distance on the average than the business handled in the early months of the year. In other words, it is likely that the loadings in October will be extremely heavy even if the net ton-miles or the revenue ton-miles do not exceed those for May. It is not at all unlikely, therefore, that we shall experience a severe car shortage at that time.

Will There Be An Increase in Equipment?

In an article entitled, "Rail Facilities Expansion Behind Traffic Growth," which appeared in the *Railway Age* of aJnuary 6, 1923, there was a detailed study of the expansion in the volume of equipment and other railway facilities as compared with the increase in the traffic over a period of years extending from 1900 to 1921 and it was shown that the traffic in the more recent years of the period had grown in greater ratio than the facilities available to handle it. Much is being said at the present time concerning the vast sums of money which the railroads have appropriated for new equipment and other facilities. For the two years, 1922 and 1923, they are preparing to spend $1,500,000,000, of which $1,100,000,000 is for new cars and locomotives and $400,000,000 for other facilities. As a result of this program, the railroads put in service in 1922 1,379 new locomotives and 77,221 freight cars. Between January 1 and May 1, 1923, they have received an additional 1,228 locomotives and 50,151 freight cars and on May 1 there were still on order to be delivered later in the year, 1,956 locomotives and 115,756 freight cars.

The point that must always be borne in mind in connection with these acquisitions of new equipment is that while the railways are adding new power or new cars, they are also retiring old equipment at a fairly rapid rate and still have a considerable amount of equipment now listed as unserviceable or bad order which is to be retired as soon as conditions permit. The figures of retirements for 1922, or for 1923 to date, are not yet available. In 1920, the railroads retired 1,254 locomotives, whereas they installed only 1,017 new ones. In 1921, additions were 1,330 while retirements were 1,134, resulting, therefore, in only a slight addition to the total number of locomotives owned at the end of the year. As a matter of fact, the number of locomotives owned by the Class I railroads at the end of 1921 was actually less than at the end of 1919. Ownership at the end of 1921 totaled 64,931 as compared with 64,746 at the end of 1920 and with 64,983 at the end of 1919.

The situation with respect to freight cars is even less satisfactory. Additions in 1920 totaled 36,044 and retirements 75,197, and in 1921 additions were 62,351 and retirements, 68,661. As a result, the number of freight cars in service at the end of 1921 was 2,344,787, less actually than at the end of 1920, 1919 or 1918, and only slightly in excess of the figure at the end of 1917. The actual figures for freight carrying cars for the Class I roads, excluding switching and terminal companies, show the following: At the end of 1921, 2,344,787; 1920, 2,350,707; 1919, 2,389,860; 1918, 2,354,-244.

The locomotive tractive effort at the end of 1921 was greater than in the years preceding it, due to the larger average tractive effort per locomotive. In the case of freight cars, however, the increase in capacity per car was not sufficient to balance the decrease in the number of cars. As a result, the total freight carrying capacity of the freight cars on the Class I railroads was 98,531,652 tons, slightly in excess of the figure at the end of 1920, but compared with a figure of 99,001,041 at the end of 1919.

Figures for All Steam Roads Show Decreases

The Bureau of Railway Economics recently made a compilation intended to include not only the Class I carriers of the country but all of the steam railroads of the country. The results as shown in this compilation are even more striking than those given above. They show figures as follows:

LOCOMOTIVES

Year	Number	Aggregate Tractive Power	Av. Tract. Power Per Locomotive
1919	68,977	2,468,617,853	35,789
1920	68,942	2,507,075,830	36,365
1921	68,718	2,506,282,896	36,472

FREIGHT CARS

Year	Number	Aggregate Capacity	Av. Capacity Per Car
1919	2,426,889	101,686,649	41.9
1920	2,388,424	101,269,178	42.4
1921	2,378,682	101,093,885	42.5

Not the least interesting detail in connection with these figures is the fact that the year 1921 was the first year in which there was a decline in the aggregate tractive effort of locomotives. It will be some time before it will be possible to know what effect on the figures the large acquisitions of

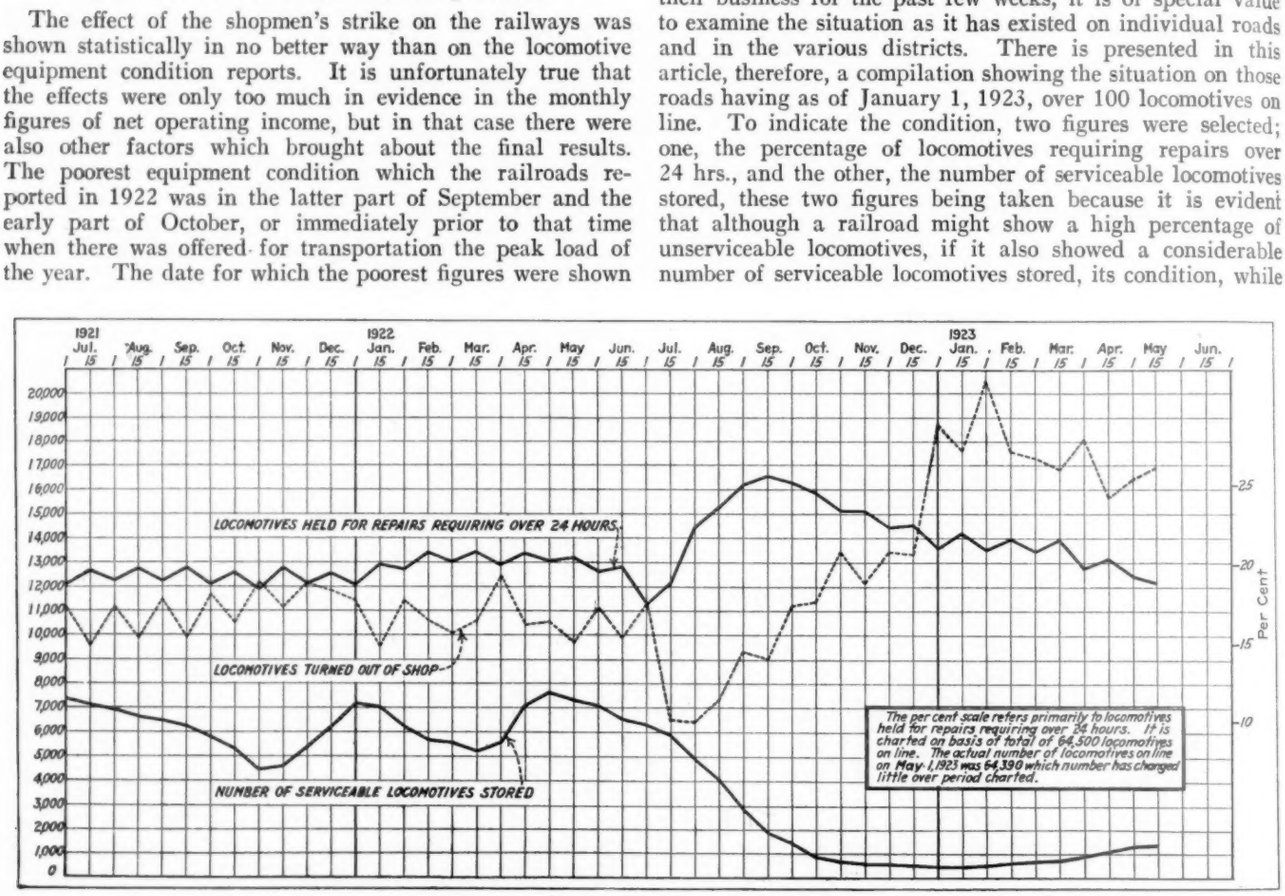
new power during 1922 and 1923 will bring about. It is to be hoped that the acquisitions will be sufficient to change the trend in the equipment situation which is evidenced in the figures which are given above. It must be borne in mind, however, that while there will be large additions in the form of acquisitions of locomotives and cars, there will also be shown a large volume of retirements of equipment which has outlived its usefulness, a point which was brought out above.

Locomotive Condition Shown by Roads

The effect of the shopmen's strike on the railways was shown statistically in no better way than on the locomotive equipment condition reports. It is unfortunately true that the effects were only too much in evidence in the monthly figures of net operating income, but in that case there were also other factors which brought about the final results. The poorest equipment condition which the railroads reported in 1922 was in the latter part of September and the early part of October, or immediately prior to that time when there was offered for transportation the peak load of the year. The date for which the poorest figures were shown was that of September 15, at which time there were held out of service for repairs requiring over 24 hrs. 16,572 locomotives, or 25.8 per cent of the total number on line. The railways on May 15 reported 19.0 per cent of their locomotives held for repairs requiring over 24 hrs., the lowest percentage which they had reported since July 1, 1922, when such preparations as the carriers were able to make for the shopmen's strike, brought the percentage down to 17.6. On May 15, the number of locomotives held for repairs requiring over 24 hrs. was 12,183. The number serviceable was 50,587, this being the largest figure which the locomotive equipment condition reports have shown since their compilation was begun.

Because of the reduced volume of traffic in the second quarter of 1922, the railroads had a considerable number of locomotives stored, the largest number being on May 1, when the figure was 7,620. This was rapidly reduced after the shop strike began and as the traffic began to move in larger volume in the fall months. On January 1, 1923, the number of locomotives stored had become 576. The railroads have since succeeded in putting their locomotives in sufficiently good shape so that in spite of the large volume of traffic which is now moving, there were stored on May 15 serviceable locomotives totaling 1,376. This is the measure of the progress which the railroads are making in their effort to reach a goal of 15 per cent unserviceable locomotives on October 1 of this year.

Because of the importance of the locomotive repair situation as it relates to the difficulty which the railways had in handling properly their traffic in the latter months of 1922 and, on the other hand, to their degree of success in handling their business for the past few weeks, it is of special value to examine the situation as it has existed on individual roads and in the various districts. There is presented in this article, therefore, a compilation showing the situation on those roads having as of January 1, 1923, over 100 locomotives on line. To indicate the condition, two figures were selected; one, the percentage of locomotives requiring repairs over 24 hrs., and the other, the number of serviceable locomotives stored, these two figures being taken because it is evident that although a railroad might show a high percentage of unserviceable locomotives, if it also showed a considerable number of serviceable locomotives stored, its condition, while not entirely satisfactory, was better to at least that extent. Four dates have been selected as typical, these being as follows: July 1, 1922, the date at which conditions during the year were at their best, just prior to the strike; October 1, 1922, when, speaking generally, conditions were about at their worst because of the strike; January 1, 1923, which represents an average of the time when conditions were at their worst and the present, and May 15, 1923, the latest date for which figures are available.



Moving Toward the Goal of the A. R. A.

During the early months of the year the percentage of unserviceable locomotives remained practically constant, but since March 15 there has been a gradual improvement. May is the first month this year in which the percentage has decreased during the first half of the month.

Might Be Compared With Net Income Results

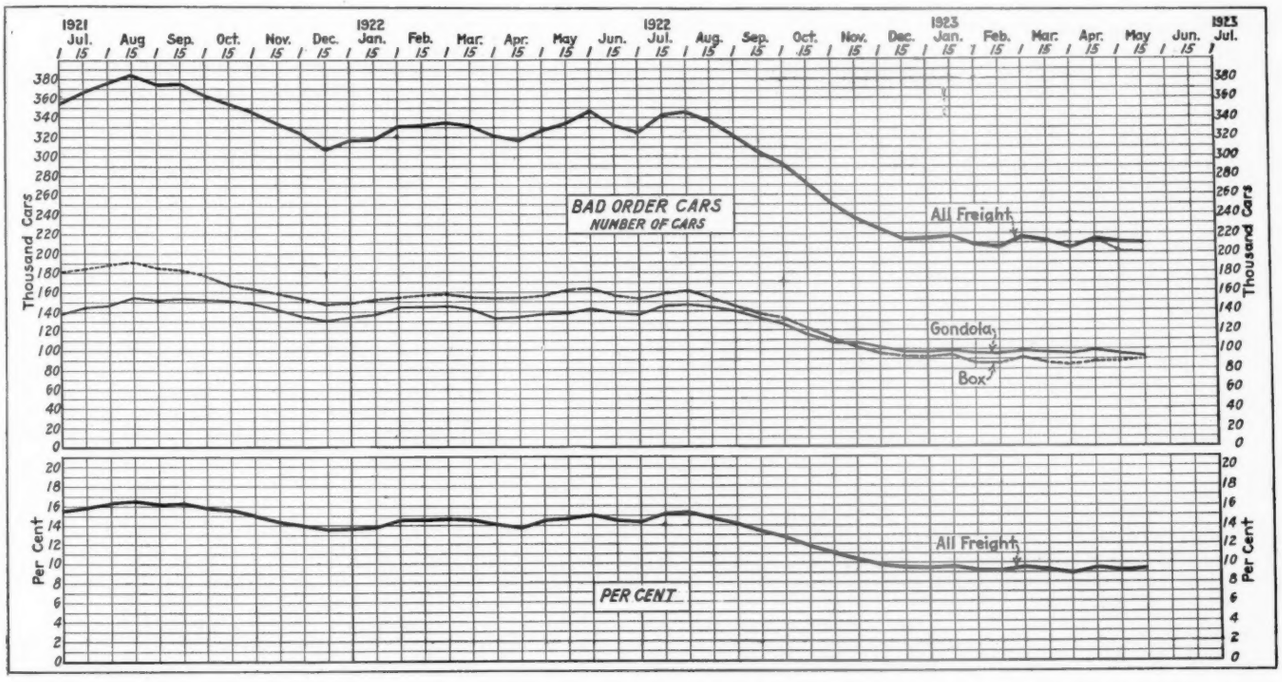
These figures should prove of unusual value and interest because they will show in very plain fashion the degree of success which the railroad had in meeting its strike conditions and similarly, the success it has since had in bringing conditions back to normal, as well as the degree of improvement which has been effected in the campaign to reach the desired 15 per cent by October 1. The condition of a road's power is so essential to the operations of a railroad that a high percentage of unserviceable locomotives might be expected to be evidenced in reduced net operating income and a higher operating ratio and it would be interesting to com-

pare the figures which are presented in the table with the monthly operating results which the individual railroads reported in the period here selected. In the tables there are given only those roads owning over 100 locomotives but the totals for the districts are given complete. It is particularly interesting to notice such things in the tabulation as the poor condition in Group B of the Eastern district on October 1, or the degree of improvement which has been effected in that district more recently; the degree of improvement in the various other districts; the fact, in particular, that the Southern district as a whole has brought its percentage down to 15.3 on May 15; the unfavorable situation on some of the roads in the Southwest even at present, etc.

Bad Order Cars

The railroads on May 15 had 9.3 per cent of their cars in bad order, the number being 210,243 of the total on line of 2,251,813. This is the latest step in the improvement which has been brought about since the latter part of 1921, when bad order car figures as between the two dates for which the figures are given, but it is noteworthy that there are very few which have reached the 5 per cent goal, whereas in the locomotive condition table there are a considerable number which have brought their unserviceable locomotives down to the desired 15 per cent. Furthermore from January 1, 1923, to May 15 the bad order cars were reduced only two-tenths of 1 per cent, from 9.5 to 9.3 per cent.

In studying the figures in either the car or the locomotive tables, one should bear in mind the point brought out above, that there are many units of equipment shown as bad order which are about ready for retirement but which are shown in the totals until the actual retirement has been effected, although the locomotives or the cars, as the case may be, are not available for service. It would be expected that there would be a gradual improvement in the bad order percentages as new equipment is added and as the old equipment is retired and this unquestionably is one of the reasons for the decrease in the amount of bad order equipment. In the case



The Percentage of Cars in Bad Order Has Remained Practically Unchanged Since the First of the Year

on September 15 the percentage of bad order cars was 16.3. Throughout the first three-quarters of 1922, the percentage averaged slightly less than 15 and it was not until September that any marked reduction began to be in evidence.

The percentage of bad order cars does not show the same effect of the shop strike as was evidenced by the locomotive condition figures. It is for that reason that a different method is followed in showing the freight car condition on the individual roads in the table headed, "Freight Cars in Bad Order, Class I Roads," in the present article. In this table the roads included are the same as those included in the locomotive compilation. The figures are given for all cars as of June 1, 1922, selected because it is more or less of an average of the conditions prior to September, and on May 15, 1923, the latest date for which figures are available. The figures selected from the Car Service Division reports show for each of these dates the total cars on line, the cars awaiting repairs, divided between light, heavy and total, and finally, the per cent to total on line. The A. R. A. transportation program has set a goal of 5 per cent to be reached on October 1. There are practically no roads in the table which do not show a very substantial improvement in their of cars, in particular, it is also to be supposed that there have been a considerable number of cars which may have been required because of increase in traffic and which have been put back in service possibly without entirely adequate repairs. There is no getting around the fact, however, that the railways have made very substantial progress in their equipment repair situation. As far as locomotives are concerned, there should be evidence enough in the manner in which the railroads are handling their present heavy traffic without a car shortage. In the case of freight cars, an additional point is in evidence in the very substantial decrease in the cars held for heavy repairs. This is the result of the comprehensive car rehabilitation programs which a number of the railroads have been carrying out over a period of several months.

THE CHICAGO & NORTH WESTERN, in May, operated 2,609 through passenger trains on its lines east of the Missouri river of which 97 per cent arrived on time. Of the trains run between Chicago and Milwaukee and between Chicago and St. Paul, 100 per cent arrived on time.

Milk Car for the Boston & Maine

THE LACONIA CAR COMPANY, Laconia, N. H., has completed the delivery of 25 milk cars to the Boston & Maine. These are designed for use in either passenger or freight train service.

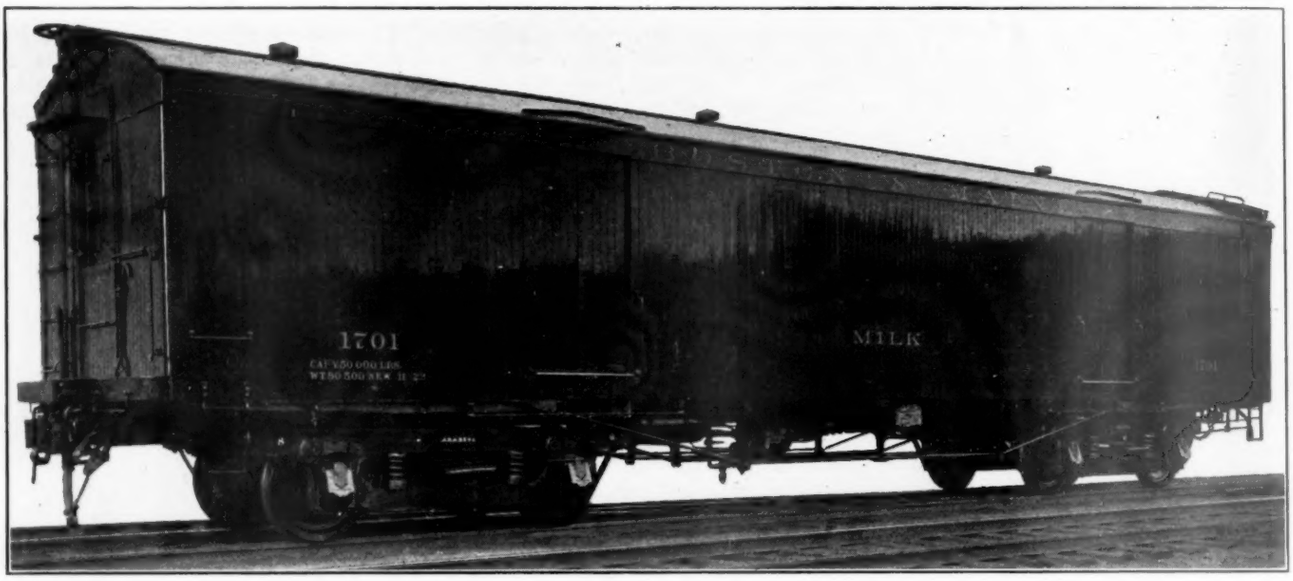
The underframe is of simple but strong construction, being composed of cast steel double body bolsters and platforms with two cast steel cross-bearers and one cast steel cross-tie at the center, all of the Commonwealth Steel Company's make. The center sills are Bethlehem H columns, 9⅞ in. (49 lb. per foot) with the webs riveted to the body bolsters and the flanges secured by ⅜-in. steel splice plates.

Uniformity of temperature is maintained by the Vapor Car Heating Company's system of steam heat, with two 12-pipe radiators bolted to one of the sides at the center of the car.

The trucks are the standard Commonwealth 4-wheel type with 5 in. by 9 in. journals, and 36 in. rolled steel wheels. The truck wheelbase is 8 ft. and the weight of the trucks is 27,800 lb. per pair.

The following is a brief specification of the car:

Length over end sills	51 ft.
Width over side sheathing	9 ft. 11¼ in.
Height rail to eaves	11 ft. 6 in.
Truck centers	33 ft.
Draft gear	Miner friction, A3P
Buffing gear	Miner B-10



Milk Car Built for the Boston & Maine by the Laconia Car Company

The side sills are 5 1/16 in., 14 lb., Z-bars extending the full length of the underframe. Four 1½-in. truss rods reinforce the underframe.

The floors—three in number—are all of Southern yellow pine; there is a 13/16-in. false floor carrying the insulation, an under floor 1¾-in. tongued and grooved, and a top rift floor, 13/16 in. by 3¼ in. face, sloping downwards to the sides with its highest point at the center of the car. Underneath the top floor is a Barrett-specification floor made up of pitch, sheathing paper and special felt. Drainage from the ice is effected by means of drop pipes leading out of copper gutters which extend the entire length of the car on both sides.

The side posts and braces are 2¾ in. by 4¾ in. oak with malleable iron shoes and caps. There are two double doors on each side, opening inward and hung on heavy malleable hinges. These doors when closed are made airtight by Miner-LaFlare car door insulation and Miner side door fasteners.

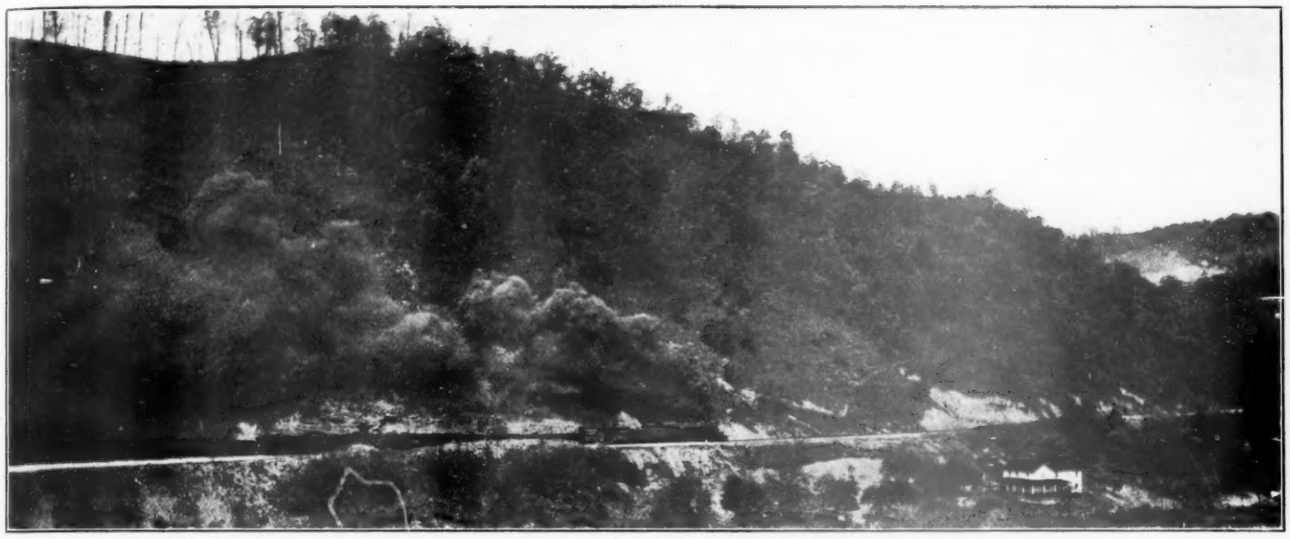
The ends of the car have oak framing reinforced with steel. A small swinging end door opening inward is located 3 ft. from the floor.

The roof is of the single curve type with inside lining of 13/16 in. by 3¼ in. face North Carolina pine and an outer course of 13/16 in. tongued and grooved spruce, covered with No. 6 cotton duck in a single piece 134 in. wide. Ample ventilation is obtained from six 5-in. globe ventilators. The roof is insulated by two ½-in. thicknesses and the sides, ends, doors and floors with a single ½-in. thickness of insulation—Keystone hairfelt Arctic brand and heavy refrigerator paper being used in all cases.

Couplers	McConway & Torley Pitt, single stem
Air brakes	New York, P. M. 1412 with double-end air signal schedule K
Weight of unloaded car	70,500 lb.

P. & A.

A Train of the Brightly-Painted "Goldenrod Orange" Cars in New York Which Are Attracting Passengers to the Interborough Rapid Transit's Elevated Lines



A Heavy Coal Train on the Virginian West of Rock, W. Va.

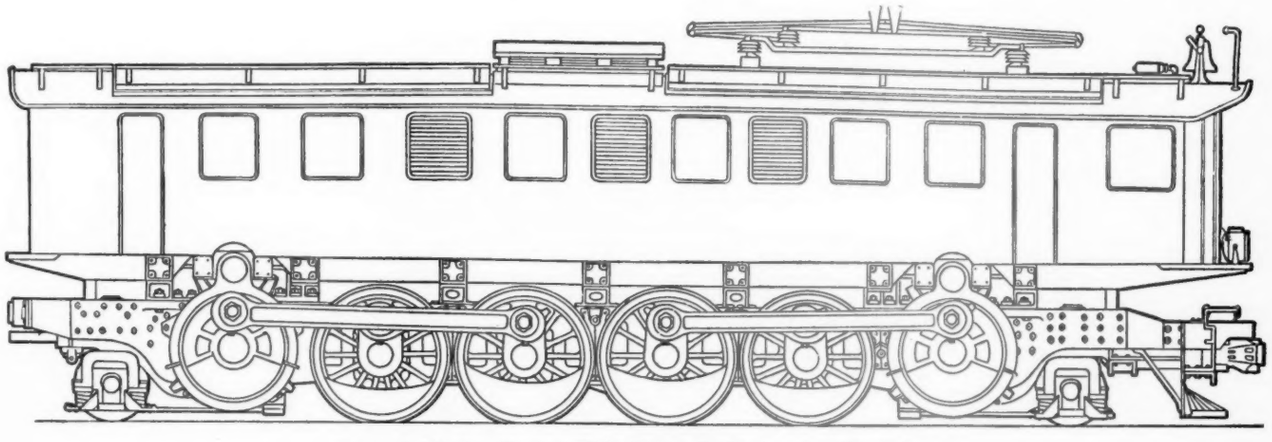
Locomotives for the Virginian Electrification

Will Handle 6,000 Tons Over Mountains and 9,000 Tons on Down Grade—Construction Details

By R. L. McClellan
Westinghouse Electric & Manufacturing Company

THE ELECTRIFICATION of the Virginian Railway, which was dealt with briefly in an article which appeared in the *Railway Age* of May 5, page 1115, embraces 134 route miles (213 miles of track) between Mullens, W. Va., and Roanoke, Va., and includes the district most difficult of operation because of the severe grades met with by the road's heavy coal trains in crossing the Allegheny mountains. It represents one of the most important single undertakings entered upon by any railroad since the war and is said to represent the largest single contract for railroad electrification ever awarded. The project provides for handling all freight electrically, involves the construction of a large steam generating station, transmission lines, an overhead trolley system and a number of electric locomotives, and makes provision for material increase over present traffic capacity. The undertaking involves an expenditure of $15,000,000. The contract for all equipment has been awarded to the Westinghouse Electric & Manufacturing Company and the alternating-current single-phase system is to be used.

The Virginian Railway, built by the late H. H. Rogers, extends from Deep Water, West Virginia, through the rich Pocahontas and New River coal fields to tidewater at Norfolk. It is preeminently a coal road with a heavy eastbound traffic. The railway has long been recognized as a leader in the movement of heavy tonnage and in the operation of exceptionally heavy trains and the use of the largest of steam locomotives. The Virginian first became conspicuous for what was then referred to as its extravagant policy of



Type of Motive Power Unit Being Built for the Virginian

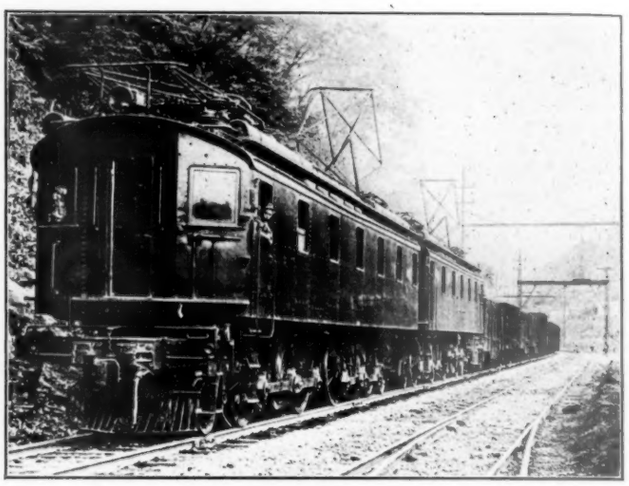
designing, building and equipping for the movement of tonnage materially in excess of what then appeared to be reasonable expectations. "Roger's folly," as it was then called, has, however, since been vindicated. The Virginian has, in late years, been conspicuous for its 120-ton coal cars, the use of the most powerful Mallet locomotives, the operation of 8,000-ton trains and the development of a coal pier at tidewater of remarkable proportions, and is now establishing a new claim for leadership in undertaking electrification.

The principal objects of this undertaking are two: First, the expansion of its traffic handling capacity; and, second, the improvement of operating efficiency or reduction in ton-mile costs.

The Virginian is now moving, from Mullens, W. Va., to Norfolk, Va., about 7,000,000 tons of coal per annum. This movement is made in trains of approximately 5,500 tons up the west slope of the mountains at a train speed of about 7 miles an hour and thence down the east slope of the mountains and to tidewater in trains of 6,000 tons. With electric operation trains of 6,000 tons will be moved up the west slope of the mountains at 14 miles an hour and will be filled out there to 9,000 tons for movement to tidewater. The initial operation will be laid out for an annual movement of 8,000,000 net tons of coal and the system will be designed to have a capacity for handling more than twice this amount. The higher train speeds, the uniformity of speeds and the greater amount of power which can be applied to an individual train will enable the movement of more than twice the present tonnage.

The expectation of the management is that the electric locomotives will be available for service during a greater portion of the time than the present steam equipment, that the cost of maintenance for electric locomotives should be less than for steam and that the production of power in a stationary power plant should be more efficient than in the steam locomotive, bringing material economies.

The system adopted is the alternating-current, single-phase system with an overhead trolley, similar to that in use on the Norfolk & Western, the New York, New Haven & Hartford, the Pennsylvania at Philadelphia, the Grand Trunk, the Boston & Maine and the Erie.

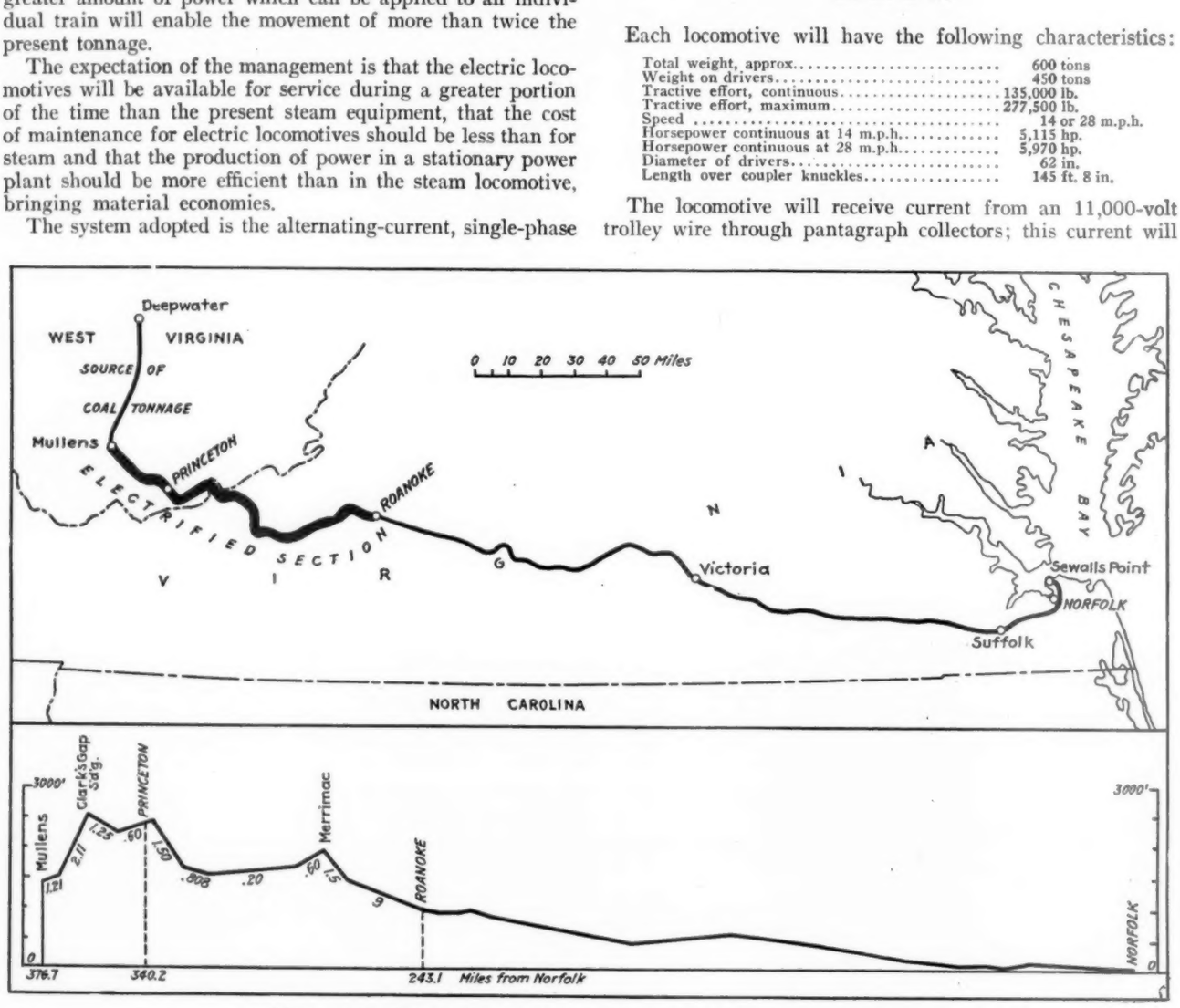


A 270-Ton Electric Locomotive with Heavy Coal Train on the N. & W.

Each locomotive will have the following characteristics:

Total weight, approx.	600 tons
Weight on drivers	450 tons
Tractive effort, continuous	135,000 lb.
Tractive effort, maximum	277,500 lb.
Speed	14 or 28 m.p.h.
Horsepower continuous at 14 m.p.h.	5,115 hp.
Horsepower continuous at 28 m.p.h.	5,970 hp.
Diameter of drivers	62 in.
Length over coupler knuckles	145 ft. 8 in.

The locomotive will receive current from an 11,000-volt trolley wire through pantagraph collectors; this current will



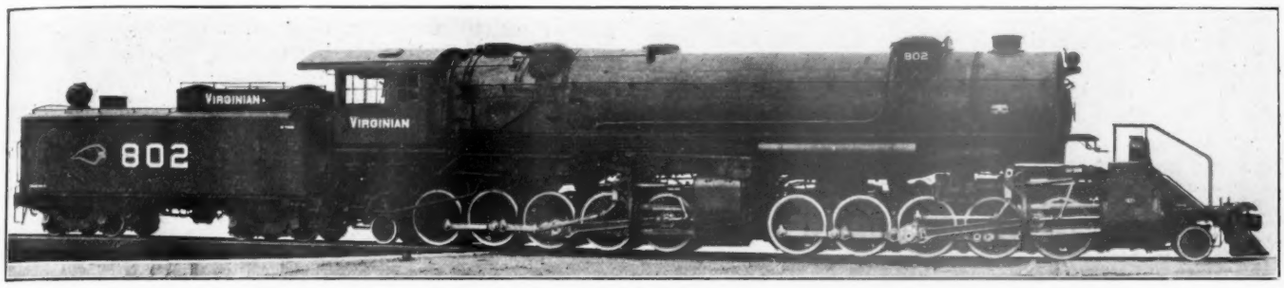
Map and Profile of the Virginian Showing Section to Be Electrified

be stepped down by transformers in the locomotive cabs to a low voltage and delivered to the phase converters which will convert this single phase to three-phase current for use in the main motors. The main motors, six in number, will be of the induction type with wound rotors, controlled by liquid rheostats in the secondary circuits. Induction motors are used with a view of providing ruggedness and simplicity of construction and a dependability of operation which characterize this type of motor and does away with the use of commutators.

Power is transmitted through gears and pinions to jack shafts which are connected to the drive wheels by side rods. There are six such motors and six jack shafts per locomotive, each connected to two driving axles. This design enables mounting the motors above the locomotive frame, and the use of side rods makes possible the use of the entire weight on drivers for adhesion, making possible a tractive effort in excess of that possible with individually driven axles.

A feature of the system adopted is its unusual capacity for regenerative braking. It has long been recognized that in such an operation as that of the Virginian one of the most serious problems is controlling trains while descending steep grades. This will be accomplished in this case entirely by regenerative braking, the air brakes being held entirely in reserve for emergency use. With the type of motor and the system adopted the full capacity of the locomotives is available for holding on down grades and this permits holding a heavier load descending a grade than can be handled up the same grade.

A steam power station with an installed generator capacity of 50,000 kw. will be built at a convenient location on the New River near the middle of the section to be electrified. Single-phase current will be transmitted at 88,000 volts over twin circuits on steel towers. The voltage will be reduced by means of transformers located at intervals along the right-of-way to 11,000 volts for the use on the trolley. The trolley system will be of the inclined catenary type utilizing a bronze contact wire and steel messengers all supported on steel poles and structures. No substations with revolving machinery are required for the system adopted for the reason that the locomotives utilize the same kind of current as is generated in the power station, i.e., alternating-current single-phase. The power is fed to the trolley by simple out-door type transformer stations.



The Heavy Type of Mallet Now Used to Handle Virginian Coal Trains

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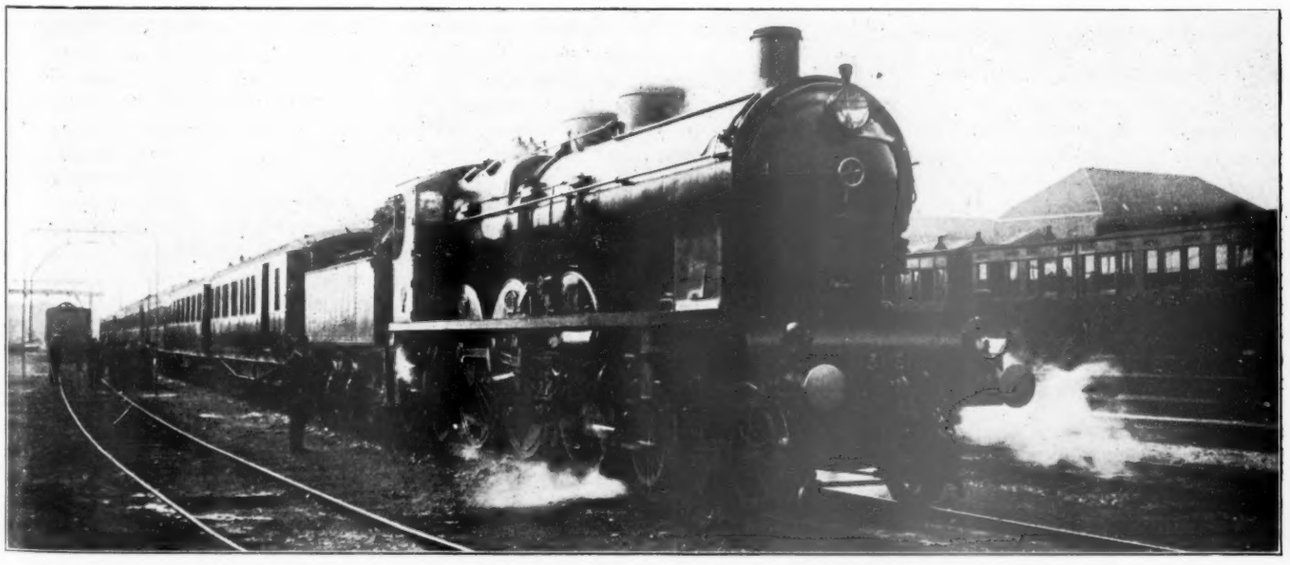
IN THE DERAILMENT of an eastbound special train on the Grand Trunk, about two miles west of Durand, Mich., on the morning of June 5, two passengers, the engineman, the fireman and a newsboy were killed, and about 40 persons were injured. Most of the injured and the two passengers killed were members of a party of Knights Templar on their way to their state convention at Flint.



Kadel & Herbert

Paris-Brussels Express (Northern and Belgian State Railways) Which Recently Made the 193-Mile Run in 3 Hours 20 Minutes

Great Northern Train Control Committee Reports

THE GREAT NORTHERN, the Northern Pacific and the Chicago, Burlington & Quincy are co-operating in the testing of various train control devices in an effort to determine on the particular type of device which will best meet their operating conditions. Each road is to make tests of three different devices on short stretches of track. In this way nine different kinds of apparatus will be tested. While the roads are working together in the preliminary tests, each road will select the kind of equipment it desires to install irrespective of what the other two roads may decide upon.

The train control committee of the Great Northern has already tested and reported to its management on the Miller Train Control Corporation's device and on that of the National Safety Appliance Company. It still has to report on the Automatic Control Company's device.

The Miller device, which is of the ramp or intermittent electrical contact type, was installed on engine 1433 of the H-3 class and on engine 3229 of the O-4 class. The National Safety Appliance device, which is of the intermittent induction type, was placed on engine 1430 of the H-3 class and on engine 3232 of the O-4 class.

The Miller Device

On March 3, a ramp was placed in position and a test was made with engine 3229 together with a snow-dozer and a Russel snow plow to ascertain the possibility of operating this class of snow fighting machinery through territory equipped with ramps. The dozer was taken over the ramp without appreciable difficulty but the Russel plow passed over the ramp with some damage to both the ramp and the plow apron. On March 5, a trip was made from Minot, N. D., to Williston, with engine 3229 equipped with the Miller train control device hauling a train of 68 empty cars aggregating 1,640 tons. Applications were made artificially at different points on the line under practically all conditions of grades and speeds. In every case the train control apparatus made an entirely satisfactory stop without undue shocks and with no damage to equipment. On March 6, the return trip from Williston to Minot was made with a train of 30 loaded and 12 empty cars, approximately 2,500 tons. Tests similar to those of the day before were made and the results obtained were entirely satisfactory.

National Safety Appliance Company's Device

The equipment on engine 1430 was cut in service on February 23, and was allowed to operate in regular passenger service on each trip this engine made between Minot, N. D., and Williston as it passed over the track element which was located at two signals about three miles west of Minot on Gassman Hill. Operations were obtained at speeds up to 50 m.p.h. and satisfactory stops made. On March 8, the stop valve of this equipment was cut out because of foreign particles lodging on the seat of the lower valve, preventing the entire closing of this valve. The valve was taken out and a new seat applied after which it was again placed in operating position on engine 1430.

The first test on engine 3232 was made on March 3, westbound with 63 empty cars, approximately 1,800 tons. The first stop was made automatically by the engine passing over the track element at the signals at approximately 18 m.p.h. This stop was satisfactory and the train line pressure was reduced to 20 lb. before the engineman reset the apparatus on the ground. The apparatus was left in service and engine 3232 made the stop on the return trip from Williston on March 5, with 2,200 tons at an approximate speed of 30 m.p.h. On March 8, the engine equipment was revised to make possible manual operation of the apparatus and a trip was made from Minot to Williston with 62 cars, 8 of which were loaded. An automatic stop was made as the train passed over the track element going up Gassman Hill, which was satisfactory in every respect; the engineman reset the apparatus and stopped the train line exhaust after a 20 lb. reduction had been made.

As with the Miller system, tests were made at different points under various conditions of speed and grade and in every case the resulting stop was entirely satisfactory. One test was obtained which was entirely unexpected. In pulling out of Berthold, N. D., with the engine working at a speed of about 18 m.p.h. an automatic application was received which, upon investigation, was found to be the result of the collecting shoe striking a pig, bending down the shoe to such an extent that the soft babbitt pipe fitting provided for this purpose was broken. The stop was satisfactory and entirely automatic.

Conclusion Drawn from Test

In drawing conclusions from these tests the committee felt that the ramp in its present location was objectionable because of its obstruction to the operation of the snow fighting equipment now in use. To operate this machinery it would be necessary, in the opinion of the committee, to alter the outline of the snow fighting equipment and possibly also relocate the ramp.

As far as the engine equipment of the Miller type was concerned the committee felt that it was probably a little more difficult to install on the classes of engines to which it was applied because of the space available, but that after the installation was made it offered no particular obstruction in the engine cab. The committee did not feel that any difficulty would be experienced in the handling of the air brake equipment by the Miller system of control under train control requirements.

The committee favored the National Safety Appliance Company's track element, because it constitutes practically no obstruction along the track. It was also felt that it was not so difficult to make installation of the engine equipment as in the case of the Miller type and that after installation it caused no obstruction in the engine cab. As far as damage to trains and the ability to make satisfactory stops automatically, the method of handling the air by the National Safety Appliance Company's equipment proved entirely satisfactory.

It was the thought of the committee that additional protection against foreign particles, such as pipe scaling and rust from the train line should necessarily be made in the engine equipment of the National Safety Appliance Company's system, probably in the form of screens or dirt collectors placed in the line of the stop valve. It was also thought that by the application of some form of safety valve, the continual bleeding of the train line could be prevented after the reduction of 20 lb. or 25 lb. had been made, but that it should be borne in mind that the apparatus is not for the continual operation of trains but is to be called on in emergencies when enginemen become incapacitated. The committee pointed out that it has been shown the present arrangement should handle trains without undue shock or damage to equipment and any further apparatus installed under the above conditions might be considered undesirable and merely add complications. The other points the committee has not finally determined is the possibility of the freezing of the duplex control valve or its protection from condensation because of its location at the lowest point of the system. Although tests were made through very severe weather no difficulty because of freezing was found. It was the feeling that trouble of this kind may not occur but the construction is such that the possibility exists and must be guarded against.

A Basic Weakness of Railroad Organization*

More Attention Must Be Given to Selecting, Training and Inspiring All Employees

By Roy V. Wright
Managing Editor, *Railway Age*

Is it not true that the whole question of personnel has not been given the same consideration on the railroads at large as it has in many of the more progressive industrial organizations? Is it not even more important for the railroads to face up to the problem squarely than it is for the average industrial concern? Railroad forces are scattered over great areas and the problem of adequate supervision is exceedingly difficult as compared to even the largest manufacturing industry. A railroad executive who gave special attention to the problem of organization likened a railroad organization to a pyramid, the rank and file forming the base upon which were superimposed the various grades of supervision, with the chief executive at the apex. His thought was that an effective or stable organization must be built upon a basis of enthusiastic and intelligent workers in the rank and file. If the workers are indifferent or careless, or are not properly selected and trained, then the whole structure is unstable and cannot function effectively—indeed its very existence may be threatened.

When the railroads were small the chief executive and his principal subordinates knew most of the men in the organization—knew them so intimately that they recognized their strong points and their weaknesses. In most cases they knew the family conditions and problems and showed a sympathetic interest in the welfare of the individual employees. Young men entering the organization were carefully selected and were thoroughly coached and trained in their duties. Is this true today? How many heads of departments, or even of local organizations, know all their men personally or even find opportunities to come in personal contact with most of them?

The growth and extension of the railways has been so rapid, and so much attention has had to be given to equipment and facilities, that the importance of personal contacts with the men has been lost sight of to a great degree. This was not done intentionally, but was brought about purely by the force of circumstances. It is true, also, that it is only in recent years that progressive industrial leaders have awakened to the seriousness of a similar situation in their plants and have adopted various measures to overcome the difficulties and re-establish the right sort of relations with the men.

The trouble has been that while it is comparatively easy to determine the concrete savings and advantages of improving facilities or adding machinery, or changing methods of operation, it is extremely difficult, unless an executive is endowed with a real vision, to determine the concrete advantages of improving human relationships. We speak of the loss of morale, but it is difficult to realize fully just what it means in decreased production or loss of efficiency. Executives in many cases have not been trained to recognize this and to know how to translate the loss of morale into concrete terms—indeed, it is so intangible that often the loss of morale is not noticed until an emergency focuses attention upon it.

How About the Clerks?

Let us consider the clerical forces, for instance. How much time or thought or real consideration is given to the selection and training of clerks? These men as they develop handle important correspondence and records and are a vital part of the railroad machine. How much attention is given to training the clerks or others in the understanding of human nature and how to deal justly and wisely with their fellows? Nothing is finer or more complicated or delicately poised than the human machine. A very little thing can often throw it out of adjustment and seriously impair its efficiency. President Smith of the New York Central has said, "It is estimated that 95 per cent of railroading is human." If this is so, ought not more consideration be given to training our forces to recognize it?

A machinist apprentice is supposed to have four years of special training to enable him to handle simple materials and operate standard machines. How much time is given to the training of clerks, some of whom advance to positions where they have control over considerable numbers of their fellows, and yet are given no special training or coaching in dealing with humans?

Are we not, in effect, putting the average clerk in a blind alley and considering him more as a cog in a machine rather than as a human being with all sorts of possibilities for improvement and development, if he is given proper coaching and training? If men are treated in this way, what will be their attitude toward the management and how far will they exert themselves to increase their capacity and efficiency? What could not be accomplished, also, if a special effort were made to inform them along the broader lines of the importance of the transportation system to the community and of the importance of their place in the organization?

It may be said that the clerks are frequently highly specialized, sometimes on comparatively unimportant statistical work, and do not require a broad training or a special knowledge of how to deal with their fellows. What kind of an organization will you have if the men in it get the idea that they are regarded in this way and realize that the opportunities before them are limited to an extremely narrow zone? Can we expect to attract the best boys and men to work in an organization which is conducted on this basis?

Educational Clubs and Employees' Magazines

It is significant that in many cases the clerks have felt the need for a larger and broader training than was being given them, and have formed various sorts of clubs or educational classes. One such club, for instance, meets once a week at a little luncheon in a Railroad Y. M. C. A. building; it secures the best men available to talk to the members on various aspects of the railroad question and the work of the various departments in which they are interested, and their relationship to the railroad organization as a whole. These meetings have been a great inspiration and have helped to develop more efficient workers and to fit the club members for a larger place in the railroad organization. These things should be encouraged by the management.

Some of the employees' magazines have been doing excellent work in educating and inspiring the employees. The difference between the best and the poorest of these magazines, however, is very great and there are big possibilities in improving some of them and making even the best of them more effective.

One railroad is publishing several regional weekly news-

*From a paper read before the Pacific Railway Club, April 19, 1923.

papers. Each of these is under the general direction of a capable editor, the news, however, being gathered by the employees and no propaganda being allowed in the papers. The possibilities of building up the morale of an organization in this way are very great. These things, of course, concern all of the employees, as well as the clerks to whom we have been giving special attention.

Track Workers

Let us consider another class of workers. Someone has said, "Well, you cannot do much for track men." The World War brought this country to a keen sense of the need of assimilating the foreigners who had come to our shores and of making real Americans of them. A large percentage of the track workers were found to be foreigners, and during the war, and since, splendid work has been done in educating these men to American ideals and preparing them for citizenship. You cannot estimate the value of such work in helping to bring up the morale of the organization and make the men more efficient. Have we not often made a great mistake in discounting the importance of these workers because of their apparent lack of education, their rough dress and the way in which many of them live? What one of us has not seen a remarkable transformation in men of this type when a little real interest and faith was shown in them. Raising a man's ideals of citizenship and self respect makes a much better employee for the railroad.

Shop Apprentices

Consider mechanical department employees. Shop apprenticeship systems have been in vogue from the very beginning of railroads in this country and yet how much have we advanced in our methods of dealing with these apprentices? It is true that some few roads have done splendid work in this direction, but the number of these is pathetically small. George M. Basford was a leader in developing modern apprenticeship methods on the railroads. He started to advocate better methods 20 or 25 years ago, at least. Our mechanical associations have discussed the question and have approved of certain principles for shop apprenticeship, and yet how much better off are we in this respect than we were years ago, except for a very few roads? Never was there so great a need for skilled mechanics as there is today, but we cannot develop real mechanics by the haphazard methods which have existed on most roads. A thorough course of training must be laid out and someone must be responsible for seeing that each boy is carefully conducted through the course. There must be a definite amount of school instruction in order that the boy may thoroughly understand the underlying principles of the job. Means must be taken to insure thorough instruction in the shop work, preferably by the use of shop instructors. The practical instruction should not be left to anybody or everybody. The amount of supervision in the average railroad shop is inadequate and special means must be taken to insure that the boy is properly and thoroughly instructed in the practical operations—and it pays and pays well, as at least one large railroad can testify.

Trainmen

How about the brakemen and firemen; they are the prospective conductors and engineers and will sooner or later have charge of the operation of the trains. They should be above the average. How much attention is given to selecting and training these men on most of our railroads? They are away from direct supervision the greater part of the time and too much emphasis cannot be laid upon the necessity not only of going to unusual pains to select the best young men along the line of the road for these positions, but of following them up in service and seeing that they are properly trained and coached, even after they have been in service for a long time.

The Supervisory Forces

We might go on and consider class by class all of the railroad workers in the ranks. Enough has been said, however, to indicate the importance of giving greater attention to every employee. Let us therefore leave the men in the ranks and go a step higher in the scale. The foremen or supervisors have charge of the men in the ranks and come in direct contact with them. They must interpret the policies of the management to the men and see that they are carried out and the work properly performed. So far as most of the workers are concerned, these foremen or supervisors are the management, and they will judge the road by the men to whom they report and under whose direction they work. The foreman is therefore placed in a most delicate and strategic position. He is the management to most of the men under him. He must be a superior sort of man and one would expect that he had been selected for promotion only after the most painstaking study and analysis and that after he was promoted great pains would be taken to instruct him in the art of handling men and in the policies of the organization as a whole. Is this true?

Please do not misunderstand what I am about to say. The railroads owe everything to the loyal foremen or supervisors in the various departments, who have stood by them through thick and thin and who have given the best in them, often without adequate reward or appreciation. These foremen generally are entitled to the greatest commendation and consideration. Nevertheless, their work could be made much easier and railroad efficiency could be very greatly increased if the managements generally rcognized the strategic importance of these men and made a greater effort to develop and improve them.

Selection of Foremen

How are foremen usually selected? Are they carefully studied from the time they enter the service and their various qualities, good or bad, definitely noted and recorded, and are these things taken into consideration when the promotion is made? Is it not true that too often a man is promoted because he is a master craftsman and seems to possess qualities of leadership, although no great check may be made to determine what qualities are actually needed for the higher position or whether he possesses them in the proper degree. Sometimes a man is promoted because at the time when it is necessary to make a change he happened by some incident to have attention focused upon him. This particular performance may have little to do with qualities which are needed for the successful leadership of men.

Let us suppose the man is a master craftsman and that in a small way he has had an opportunity of indicating that he does possess certain qualities of leadership. The promotion is made. Surely the man is taken aside and given some intensive training in the leading and controlling of the human element. Unfortunately, in most cases, he is not! He is put in the position with some general instructions and cautions. In a limited number of cases a wise executive may find an opportunity of giving him some general coaching, but this is seldom done in a systematic way. He may have lying dormant in him all of the qualities required to make good in a decided fashion, but unless he is given some training, how in the world can he develop these? The result is that today men who could make 100 per cent foremen are functioning at 50 or 60 per cent. There are foremen in service who are not at all fitted for that position and yet so little check is kept upon them in many cases that they are allowed to function in the position long after they should be transferred to other work.

Foremen's Clubs

Fortunately the railroads are awakening to the seriousness of this situation. Some of the foremen, as individuals, and

without any suggestion on the part of the managements, are taking special courses in foremanship. During the past year several foremen's clubs were inaugurated on one road. The men pay small dues, which with a contribution from the company makes it possible to bring in experts from the outside, to talk to them about the fundamentals of good foremanship. The clubs held ten meetings during the season. In addition to the experts from the outside, some of the talks were given by executive officers who spoke on the policies of the organization and the relationship of the foremen to the organization as a whole. The talks or lectures cover a period of about one hour, after which the club separates into small groups of 20 or 25 each for open forum discussion on the application of the principles developed by the speaker to their own work. It appears that the plan has been a real success. The men in the first club at the end of the season a year ago spent an evening discussing the benefits of the club. Among the benefits mentioned were that it trained and inspired them to think along the right lines; it assisted them to attain the proper ideals of supervision and discipline, and to co-operate with one another for their common good and the profit of their employer.

Personnel Departments

Many industrial organizations have found that it paid well to give their foremen special courses in foremanship; it must be understood that these courses are not related to craftsmanship, but rather to the underlying principles of leadership or successful foremanship. We have specialists on railroads, such as general boiler inspectors, who with their associates give all of their attention to studying the condition of the boilers and seeing that they are maintained to a certain standard. Other specialists devote all of their time to the study of shop tools and machinery, or in looking after some special class of work. When it comes to the biggest thing in railroading, however—the human factor—comparatively little seems to have been done in this respect. It is true that two or three roads now have vice-presidents in charge of personnel and that other roads are building up or considering the inauguration of personnel departments.

One of the important functions of the personnel department should be to see that the foremen and other officers are coached and perfected in the art of leadership. Another important function is to set up the proper machinery for selecting men for the service and of seeing that they are assigned to that class of work for which they are best suited. Today a great many roads employ such men as are at hand, or easily obtained, without giving more than superficial attention to their various qualifications. Other roads keep in touch with the young men in the various communities along their right-of-way and try to attract the brightest young men to their service. Obviously there are distinct advantages in this latter course.

It is important that the men should be followed up in service and carefully studied after they are employed. This is not a complicated proposition, but it does require careful and painstaking attention. A few years ago a railroad executive came to the conclusion that he could solve the problem by employing a phrenologist who would not only examine the men who were about to enter the service, but also those who were considered for promotion. It was pointed out to him, however, that even if it were possible for a phrenologist accurately to determine a man's characteristics by examining his head, it was still another problem to determine just what combinations of qualities were required for each one of the great variety of classes of work which must be performed on a railroad.

Finally the executive concluded that he must find some other way of successfully selecting and assigning the men to the type of work for which they were best fitted. His attention was then directed to a simple and yet practical method by which a man could be studied and developed. He did not adopt it but it has been used successfully. Roughly, each foreman and officer should periodically be required to make a report on each man reporting directly to him. The card upon which this report is made includes the characteristics which are most desirable for the class of employees in question, and the foreman or officer is expected to record his impression of whether the workman is good, fair or poor as to these various qualifications. If a man consistently proves to be weak in certain important respects, the question comes up as to whether every effort is being made to improve him or if he can be transferred to work which could be performed to advantage without the particular qualifications in which he is weak.

An important function of these report cards relates to the promotion of the men. Looking over the reports for a considerable period of time it can be easily ascertained whether the man is weak in any of the important characteristics involved in the successful leadership of men. It is always a serious mistake to promote a man and then find that he is not strong enough to hold the position and must be demoted. Every effort should be made to prevent a thing of this sort happening.

Employee Representation

Another serious problem in organization has come to the forefront in recent years—that is, what are the functions of management and to what extent should the employees participate in the control of the organization? Not a few industries have made experiments in industrial democracy and employee representation. From these experiments certain principles have been developed, so that today the path is fairly well blazed for a successful method of employee representation. C. B. Seger, formerly with the Union Pacific, and now chairman of the board of directors of the United States Rubber Company, in speaking on "Employee Representation and Personnel Work in a Large Scale Organization with Many Plants" before the annual meeting of the Academy of Political Science in New York, November, 1921, made this statement:

"There must be an intimate and frequent intercourse between employer and employee. By the very nature of things this intercourse cannot be personal or individual, although I for one should like nothing better than personally to know and deal directly with every employee in the organization of which I am a part. This is impracticable. Therefore the point of contact for communication must be through some form of representation or representative body. I believe that the nearest approach to an equivalent of the individual relationship which should exist between employee and employer is through shop councils consisting of elected representatives of the employees and the local management representing the employer.

"Employee representation should mean nothing more or less than a plan which provides systematic and regular contacts between employer and employee. Such a plan permits employer and employee to talk over matters of mutual interest, whether it be hours of labor, working conditions, wages and production costs, or what not, in such a manner as to constitute a definite procedure by which their conclusions may be made effective. The success of any such effort, however, is determined by the sincerity with which it is entered into both by management and employees."

The last sentence is vital. It is fruitless and a waste of energy to consider employee representation unless the intentions are absolutely honest and sincere. With a successful plan of employee representation, however—and it cannot be developed in a minute—we should be able to develop the most loyal and enthusiastic co-operation on the part of all of the employees. What a great potential force would be loosened or quickened into life if we could get the whole-

hearted interest of every employee. Equipment and facilities are of course important, but are they not secondary to this other larger factor?

You say that this whole thing is intangible and visionary. Let me remind you, however, that industrial organizations have found that it paid and paid well to go into these things. Surely if they are needed in manufacturing plants, which are concentrated in one or a few places, they are far more necessary in a railroad organization which is scattered over a wide territory and with a minimum of supervision.

Then, too, there is this whole question of the relations of the carriers to the public. The seriousness of this cannot be minimized and it is hardly necessary for me to emphasize it. Did you ever stop to think what a large proportion of the voting population is made up of railway employees and those dependent upon them, and of how great a factor they could be in influencing public opinion if they were all enthusiastic supporters and boosters for the railroads? One large railroad has taken the plunge and is developing a scheme of employee representation. Others have started the personnel departments and are giving more or less consideration to this whole question of employee representation. So much is at stake that it would seem that no reasonable effort should be neglected to improve the conditions. Let me remind you again, however, of Mr. Seger's statement that the success of employee representation depends upon the sincerity with which it is entered into.

The Golden Rule on the Railroads

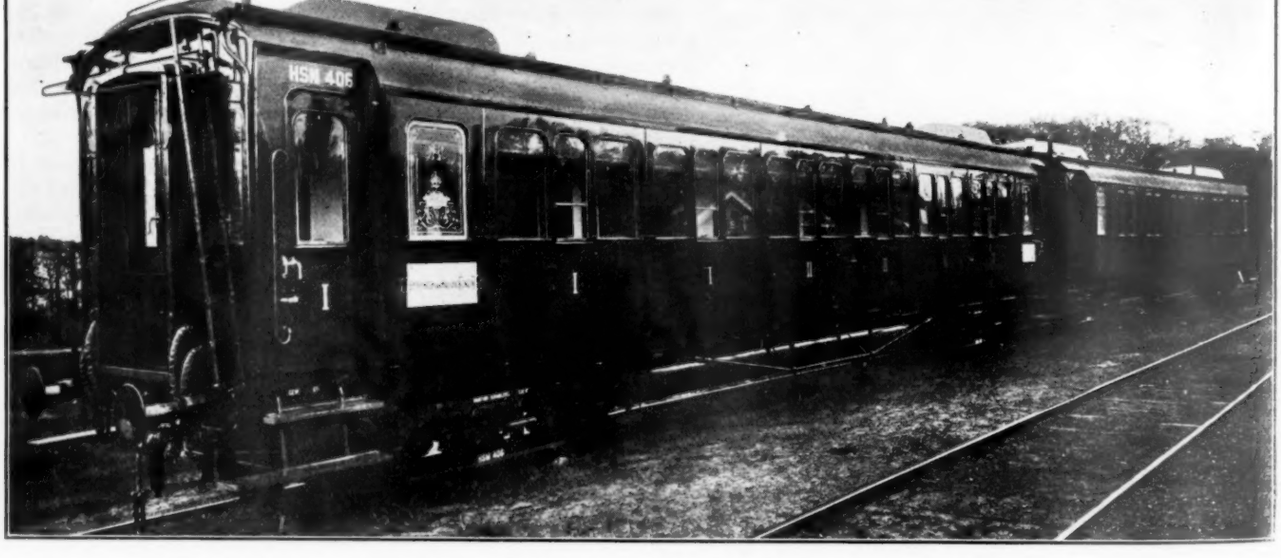
Let us approach the problem from a somewhat different aspect. I imagine that most of you are familiar with John Leitch and his scheme of industrial democracy. I heard him make an address a few years ago in which he traced the development of the human race. Our early ancestors, he said, lived largely by brute force; they secured their food by killing animals or catching fish—often they had to go hungry. This caused them to develop cunning so that, for instance, in catching the animals they devised traps instead of using brute force. Later came a period when intelligence was developed and this was followed by a still higher standard—that of moral power. Leitch's definition of moral power was as follows: "Moral power means the ability to see the path along which God is leading men forward and the willingness to co-operate with him in his leading. It is the power which enables a man to see a better land—a land flowing with milk and honey by comparison with this land that now seems to be flowing with ignorance and poverty."

Unfortunately, as Leitch indicated, too small a percentage of the great mass of people have advanced measurably to this higher standard. Men are still governed too much by their instincts and emotions and not enough by reason and moral power. This is natural because of the long period in the development of man in which intelligence and moral power were dormant and when he reacted almost entirely to his instincts and emotions. That we have made considerable progress toward higher standards in recent years is indicated by the fact that on every hand we have drawn to our attention the importance of the square deal and the application of the Golden Rule to our business and commercial transactions.

Sir Oliver Lodge, the scientist, in speaking to his students in England, commented upon the fact that hitherto science had dealt largely with molecular forces, such as steam and electricity, but that now it had its finger tips on atomic forces, such as radium. With a mass of matter no larger than a man's fist, he said, the German fleet could be lifted from the bottom of the sea and set on the hill behind Manchester. Then he paused and said, "God forbid that science now should cast its harness over the atomic forces. We are not fit to handle them. Put such a prodigious power into our possession in our present state and with it we would damn the race."

I am not so sure, however, but that the forces set up by the intensive development of commerce and industry may not be even more dangerous than these physical forces mentioned by Lodge, if they are not properly directed. Their direction, however, depends upon raising the ideals of our people as a whole to a much higher standard—the standard that John Leitch pointed out for the application of the Golden Rule in its best sense.

Vice-President E. K. Hall, of the American Telephone & Telegraph Company, in speaking before the New York Railroad Club recently, said that the railroads could perform a wonderful service if they could solve this question of relations of the employees and the management and put it on the right basis. Other businesses, seeing what had been done on the railroads, which reach every part of the country, would profit by it, and the railroads could thus perform an invaluable service to the country—a service even greater, if possible, than is rendered by the service of transportation.



Glistening Passenger Cars Built by J. J. Beijnes, Haarlem, for the Dutch Railway

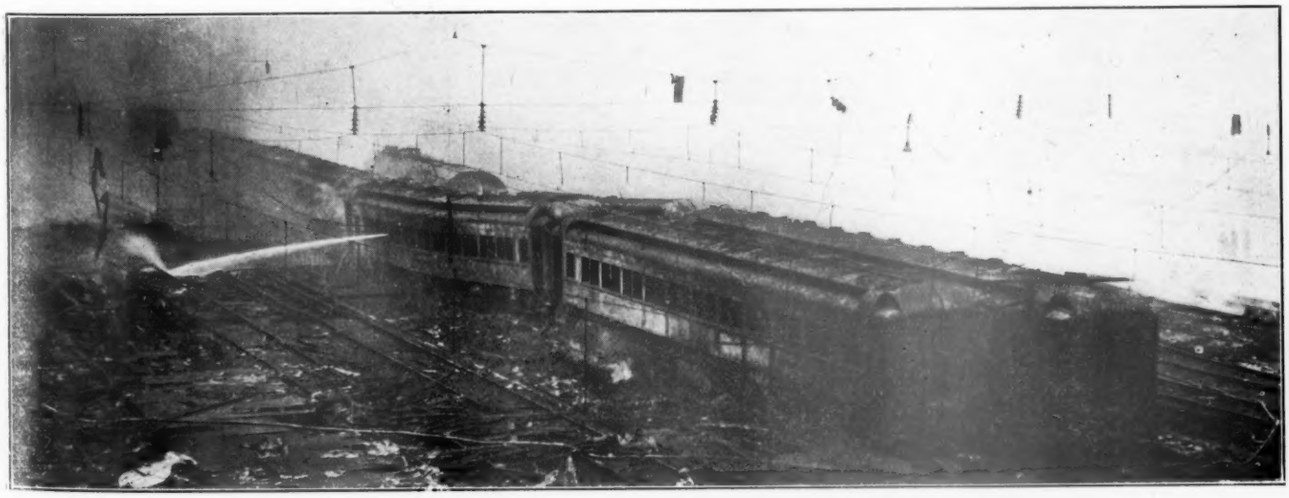
The Outer End of the Train Shed—Workmen and Work Trains Closely Following Up the Fire With Repairs.

Broad Street Train Shed Destroyed by Fire

Pennsylvania System's Famous Structure at Philadelphia a Skeleton of Twisted Girders and Arches

THE BROAD STREET TRAIN SHED of the Pennsylvania System at Philadelphia, Pa., was completely reduced to ruins by fire on Monday, June 11. From an apparently insignificant beginning, the fire spread with such rapidity and intensity that it became out of control almost from the start. The failure of the compressed air plant under the tracks so hindered the moving out of cars and locomotives that 15 cars and three locomotives were caught in the structure and practically destroyed. The entire structure was thoroughly gutted and reduced to little beyond warped and twisted steel girders and trusses. The headhouse was unharmed. The loss is estimated at $1,000,000.

The train shed, which was built in 1893, was 600 ft. long and consisted of a series of arch roof trusses measuring 303 ft. 7½ in. out to out of truss and having about 100 ft. clearance at the center. The floor system under the major portion of the shed was of deck plate girder construction which in recent years has been strengthened to carry the additional loading resulting from modern equipment. The cross ties for the track rested directly on the girders and in turn supported two longitudinal lines of timber upon which the rails were laid. The platforms were also of timber while all spaces between the platforms and the rails, etc., were covered with planking overlaid with a heavy coating of asphalt waterproofing. The



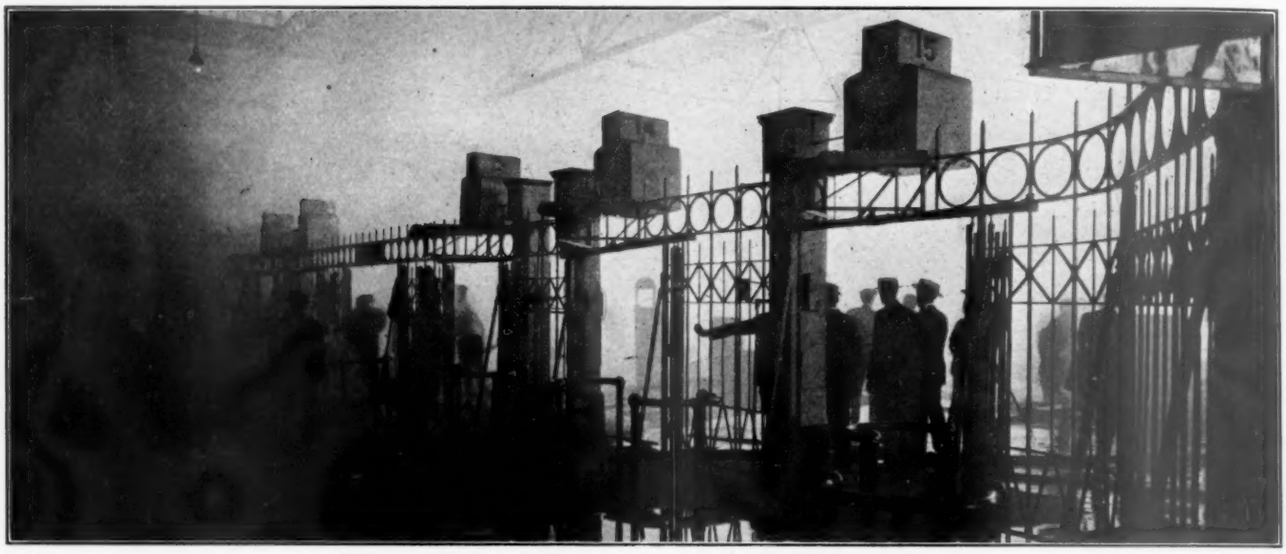
Some of the Equipment Which Had to Be Abandoned

space under the train shed was utilized for baggage rooms, mail rooms, power plant, etc., with a ceiling in the form of corrugated sheet iron suspended from the girders. The roofing of the arch, where not of glass, consisted of timber overlaid with tar and gravel.

The fire was discovered between tracks 11 and 12 by the crew of a Pittsburgh train at about 1:00 A. M. They noticed a small blaze or ball of fire. The station fire forces were called and a part of the platform planking was pulled up. As soon as this was done, flames burst out and mounted almost immediately to the roof, some supposed opening in the latter apparently causing a strong upward draft. City fire companies were immediately called while at the same time strenuous efforts were made to get the train equipment out of the shed. In the meantime, the fire seemed to break out at all points in the structure and within a comparatively short time the entire train shed, as well as the rooms and facilities below the tracks, were ablaze.

The cause of the fire is unknown as yet, but it is believed that it may have been caused by a cigarette stub, match, or possibly hot coals which started a slow fire underneath the floor construction and which gradually spread throughout the open spaces between the floor and the metal ceilings of the underneath sections before breaking through.

The facilities under the tracks consisted of baggage, mail and express rooms, a power plant for the electric lighting of the head house and office buildings, a garage, a waste room, a repair shop, some record vaults (which were not destroyed) and a storeroom attached to the special duty department and containing overalls, jumpers, etc. The mail, express and baggage rooms and the power plant were practically destroyed. The air compressors for the interlocking plant of the station were located in the power room and it was the failure of these compressors that made it impossible to save all of the equipment which was in the station. However, a number of locomotives and cars, as well as a number of Pullmans, with sleeping passengers aboard, were gotten out without damage, although it became necessary to abandon 15 cars and 3 locomotives. All but one of the cars abandoned were of steel construction; the remaining one was a wooden



The Concourse. The Fire Burned Back Under the Floor Construction to About 20 ft. Inside the Gates

At the Edge of Sixteenth St., Where the Girder Construction Ended

circus car which, due to its position in the train shed and the vagaries of the drafts and flames, escaped with little or no damage.

Two streets, Fifteenth and Sixteenth, pass under the train shed proper and it was between these streets that the fire did the greatest damage. All woodwork and timbering was completely burned out and the steel girders sagged and warped to almost a 100 per cent destruction. Fortunately no equipment fell through, a possibility under the circumstances and one which might have resulted in still further damage owing to the probable breaking or otherwise rupturing of the arch tie rods and the consequent collapse of the overhead structure.

One of the most interesting features of the fire was the fact that in spite of the loss, the Pennsylvania was able to operate

An Exterior View Showing the Completeness of the Destruction

its trains with only a curtailment of less than five per cent of its trains on Monday and this applied to local trains only. Normally there are 527 trains a day in and out of this station on week days consisting of through service and local commuter traffic. No through traffic or sleeper service was annulled, such traffic being diverted or otherwise handled at the West Philadelphia and the North Philadelphia stations. Curtailment of local service was chiefly by consolidation of trains and was handled at the two above points and at two other less important places.

Work was started immediately Monday morning, the workmen following up the firemen closely, tearing out old material and preparing for temporary repairs. The outer-end of the station layout was connected with the streets on either side by temporary stairways and the outer end of the platforms and tracks put into operation for the handling of the electrified service. Within 16 hours after the fire started, 10 trains had been operated and on Tuesday the entire electrified service of 176 trains a day was being handled in and out of Broad street on schedule. About 1,200 men are now employed with a somewhat lesser number on the night shift ripping out the useless construction, bracing and timbering up old girders and tracks for the removal of the abandoned equipment, and constructing two new platforms back to the station concourse.

It is the plan to get the station back into service as quickly as possible and to this end the existing track structure will be used wherever possible. Warped and twisted girders are to be cut out and replaced by timber trestles; old girders will be reinforced with timber bents and new platforms with umbrella sheds will be built. No plans are being made or considered at present for the construction of an entirely new station. It is expected that four tracks will be in operation through the train shed by the end of this week. Work is being pushed on the construction of a traveller to pull down the arches, which while safe, so far as train operation underneath is concerned, are too warped to be of any further value.

As a relief from the passenger situation on Monday, the Philadelphia & Reading honored all Pennsylvania tickets and inaugurated extra service between New York and Philadelphia. Although plans were made to run trains between these points on the half-hour, it was found that the addition of several cars per train and an hourly service would care for the added traffic, estimated at being between five and seven thousand passengers.

Heavy Passenger Movement of Shriners to Washington

WASHINGTON, D. C.

THE HEAVIEST PASSENGER MOVEMENT of its kind in the history of the railroads was handled into and out of Washington last week in connection with the forty-ninth imperial council of the Mystic Shrine, June 5 to 7. While exact figures have not yet been compiled showing the total number of passengers handled for this occasion approximately 150 special trains were run to Washington from all sections of the country and 984 Pullman sleeping cars were used in addition to those on regularly scheduled sleeping car lines. Of these 473 were parked at various points around the city during the week and occupied by Shriners and members of their families, while 511 were run into the Washington terminal and released. The special rate of a fare and one-half for the round trip was made available only to Shriners and members of their families and thousands of visitors in addition were attracted to the city for the occasion, as the program included many brilliant pageants and other forms of entertainment arranged by the Shriners as well as exhibitions arranged by the Army and Navy, etc. Therefore the total number of people who journeyed to Washington for this occasion can only be estimated. Special trains began coming in on June 2 and the entire movement in and out was spread over about a week, although it was mainly concentrated into four days.

The Pennsylvania handled approximately 17,000 passengers into Washington in special trains or cars alone, aside from those carried on regular trains. It operated 64 special trains and 19 special cars on regular trains and had 243 cars parked in the city. Arrangements were also made for frequent special train service between Baltimore and Washington. For one of the night pageants 1,800 were moved from Philadelphia to Washington in a train of several sections.

The Baltimore & Ohio handled approximately 10,000 Shriners, their friends and visitors to Washington in about 40 special trains, of which 30 were parked in the New York avenue yards. The Southern also moved about 30 special trains and during the week had 120 Pullman cars parked at "Shrine Park" in Alexandria, Va. A large number of trains were also brought into the city by the Richmond, Fredericksburg & Potomac and the Chesapeake & Ohio.

Unusually elaborate preparations for the handling of the large number of passengers had been made by the transportation committee of the Shrine organization, of which Harry F.

Cary, general passenger agent of the Southern, was chairman. Mr. Cary is assistant rabban of Almas Temple, the Washington Shrine organization, and to him is given much of the credit for bringing the convention to Washington. Other members of the committee were: R. R. Cooke, treasurer, Fruit Growers' Express; W. P. Scruggs, representative Southeastern Passenger Association; George B. McGinty, secretary, Interstate Commerce Commission; Nathan Weill, passenger representative, Pennsylvania; Charles W. Doings, ticket agent Washington Terminal Company, vice-chairman, and Albert P. Johnston, chief clerk passenger traffic department, Southern, secretary, and the working personnel of the committee consisted entirely of practical railroad men from various branches of the service. An information bureau was maintained by the committee at the Homer building, the headquarters of the various Shrine committees, with six men on duty in tricks of four hours each for 16 out of the 24 hours from May 31 to June 8. A similar bureau was maintained in the train concourse of the union station from June 2 to June 8 and others with three men on duty at three of the principal hotels. In addition to furnishing information and looking after details for the individual passengers the employees of the committee were kept constantly busy furnishing information to the 32 other committees of the convention organization as to the whereabouts and time of arrival of the various temples and special parties. Large bulletin boards about 50 feet long were set up at the committee headquarters and at the union station on which were recorded the movement of the various special trains and sections based on frequent reports by telegraph and telephone.

Action of Sea Water on Concrete Studied from a New Angle

THAT AMERICAN ENGINEERS in studying the action of sea water on concrete, have devoted their time too largely to the study of proportions, mixing, placing and character of the aggregates, to the exclusion of any serious consideration concerning the nature and adaptability of the cement to the purpose at hand is the opinion expressed by Wm. G. Atwood, and A. A. Johnson in a paper entitled "The Disintegration of Cement in Sea Water" presented before the American Society of Civil Engineers, New York City, on June 13. The authors are the director and assistant director respectively of the Committee on Marine Piling Investigations of the National Research Council.

Their paper represents the result of an extended research of the literature available on this subject, considerable attention being given to the reports of investigations made by European engineers and scientists. This has led to the following pertinent criticism: "In the United States, it appears that the attempt to make and use a standard cement for all purposes has probably been the cause of many structure failures and in time will cause many more. The rate of disintegration is affected by many factors, but even if the concrete is mixed and placed in accordance with the best practice, resulting in a material of maximum density, disintegration takes place, although much more slowly than if the porosity is greater."

The paper contains a detailed review of the literature on the subject pointing out that many students of the action of sea water on concrete, discourage the use of Portland cement as the sole binding material. In particular, attention is shown to the advantage of including considerable pozzuolanic materials or the use of cement containing more than the usual amount of silica. The conclusions presented in the paper are as follows:

1.—Practically all skilled experimenters with hydraulic binding agents, for the last 100 years, have agreed that the primary cause for the disintegration of mortar and concrete in sulphate-carrying waters, such as sea water and many alkali waters, is the attack on the free lime in the mortar by the sulphates of the water.

2.—The majority of the authorities agree that this disintegration can be prevented by the addition to standard portland cement of a properly constituted siliceous material, which, by combination with the free lime released in the process of setting, will form a cementing material insoluble in sulphate-bearing water.

3.—The high alumina cements attain the same results by different means which appear to be just as effective. Thus far, the cost of the high alumina cements seems to be greater than that of portland, whereas the addition of silica to portland should result in a cheaper product. Considering the greater strength of the alumina cements, it is possible that the cost per pound per square inch of strength may not be very different.

4.—The use of a single standard specification for the binding agent in all structures, whatever the service conditions, does not seem to be desirable or efficient.

The purpose of the writers in collecting the information presented was to develop for their own use the necessary data for planning a comprehensive system of tests, which it is hoped may be conducted under the direction of the Committee on Marine Piling Investigations, of the National Research Council. These tests, in their opinion, should be planned with consideration of the following points:

(*a*).—In view of the great volume of previous research work and the general agreement in the results obtained, it seems unnecessary to make further tests to determine the causes of the failure of concrete in sulphate-bearing waters, particularly in view of the comprehensive study now being made at the University of Saskatchewan under the auspices of the Engineering Institute and the Research Council of Canada.

(*b*).—Properly planned accelerated laboratory tests will give correct information as to the durability of the various binding agents within a comparatively short time. These tests should be checked by service tests which will require many years, but there seems to be no question as to the correctness of laboratory results.

(*c*).—Thorough tests should be made of standard American portland cements strengthened by the addition of siliceous materials. These tests should be for the purpose of determining the necessary qualities to be possessed by the silica; proper proportions for the mixture with cements of various compositions, and the development of the most efficient and practicable methods of mixing.

(*d*).—Similar tests should be made of the high alumina cements. In this case the method of manufacture seems to be of the greatest importance. The most desirable chemical composition of the limestone and bauxite to be used for the manufacture of this type of cement should be determined more definitely than it has been.

(*e*).—As the experiments resulting in the development of resistant cements, for the most part, have been made abroad, and consequently with foreign materials, it will be necessary to make a thorough study of the practicable sources of supply in the United States, both for the silica to be used with portland cement and the bauxite which is necessary for the manufacture of the high alumina cements.

The writers realize that many causes contribute to the failures of structures in sulphate-bearing waters, and that much work has been done, which has resulted in a longer life for these structures. They do not believe that the improvements resulting from previous experiments on methods of construction have solved the difficulty, nor that it will be solved until a cement immune from attack by sulphate-bearing waters is developed.

I. C. C. Accounting and Statistical Requirements*

Not Unreasonable—Operating Officers Should Be Trained To Make Better Use of Statistics

By Wm. J. Cunningham
Professor of Transportation, Harvard University

WHEN YOUR PRESIDENT invited me to address your association he gave me wide latitude in subject. I accepted the invitation with the thought that I might be able to say something of interest in connection with a recent statement by a prominent railroad publicist that the Interstate Commerce Commission could save the railroads more than $100,000,000 per year by limiting its calls to reasonable statistics. That statement was given wide publicity and was used by a few railroad executives to support a request that the commission should substantially reduce its requirements.

On receipt of the agenda for this meeting I find there is no need for me to assume the self-appointed task of pointing out the errors in fact and in the interpretation of the figures which were made the basis of that criticism, nor to show that the commission's requirements are not unreasonable. Your committee on general accounts has accomplished that task better than I could have accomplished it. It has clearly set forth both the inaccuracies in the basic data and the errors in deduction, and has concluded that no substantial curtailment in requirements is justified. There are, however, certain related factors which are not mentioned specifically in the report, and I shall embrace this opportunity to present three supplementary suggestions.

The first suggestion is that the Interstate Commerce Commission requires no information which any well supervised railroad would not have for its own managerial guidance. Except in unimportant particulars, the information now reported to the commission would be continued by the progressive roads even were the commission's requirements waived.

The second suggestion is that many railroads, while recognizing the value of the information required by the commission and by their own officers, do not make fully effective use of that data and other local reports in keeping close check on their operating efficiency.

The third suggestion is that the railroads as a whole do not take sufficient pains to educate their operating traffic officials in matters of accounting, nor their accounting officials in the technique of operation and traffic.

I. C. C. Statistics as Aids to Managerial Control

The present accounting and statistical requirements of the Interstate Commerce Commission are the results of evolution. From the beginning of its control over accounting and its work in establishing uniformity, the commission has been guided largely by the advice and assistance of a committee of your association. In very few cases indeed has the commission disregarded the final recommendations of your association. It has always shown a willingness to accept the judgment of railroad accounting experts as to what would be reasonable and practicable for the commission to prescribe in discharging its responsibilities under Section 20 of the Act to Regulate Commerce. On the other hand there has been an equal spirit of co-operation on the part of the railroad accountants in meeting the spirit of the act. The result is that the present structure of accounting classifications, reports, and statistics is virtually railroad-made, and the credit for the accomplishment should be accorded to your association as much as to the commission.

While the accounting requirements may in the aggregate appear to be burdensome, it is a fact that all of the information called for is of interest and the greater part of it is vital to the intelligent administration of a railroad. No progressive and well organized railroad could afford to be without the information contained in the annual and monthly reports to the commission. To discontinue any substantial part would be a step backward. In fact nearly all railroads require for their own use statistics which are much more elaborate than those called for by the commission.

Commission Might Go Further

My own opinion is that the commission might quite properly go much further in requiring additional data to enable it to meet its responsibility, under the Transportation Act of 1920, to pass upon the efficiency of operation. That the commission has not imposed further tasks is evidence of its conservatism and unwillingness to add to accounting burdens until the need is definitely recognized and the practicable method determined after mature consideration and joint conference. I believe that it would be a step in the right direction if the proposal to subdivide the primary expense accounts so as to show the labor element separately should be adopted when the classification of operating expenses is revised. I should go further and enlarge rather than reduce the number of primary accounts so that they would lend themselves more readily to the needs of statistics of cost and performance. As the classification now stands, the primary accounts in many cases do not fit in well with the demands of cost accounting. On the side of revenue and service accounting I believe that the railroads should be obliged currently to know more about the relative remunerativeness of the several classes of traffic and of the several groups of commodities. To that end an additional requirement that freight revenue and ton-miles be reported separately by groups of commodities would be justified. Likewise it would be worth more than the additional cost to know currently the revenue, tons, and ton-miles of local freight separately from interline freight. This subdivision is of importance in determining the reasonableness of divisions and will be of increasing importance as the proposed consolidations take place. A few roads compile such data for their own information and find that its value justifies the cost.

It is not my purpose here to advocate that the volume of required reports be increased. I am referring to the possibilities of advantageously expanding the requirements merely to emphasize the previous statement that the commission has not been unreasonable in its orders. Conceivably it may properly ask for much more and thereby force the backward roads to know more about their own affairs. All that the commission requires is of as much value to railroad officers in the administration of their individual properties as it is of value to the commission in exercising its public supervisory functions under the law. Unfortunately, it is too often true that the value of the information reported to the commission is not appreciated by the officers of the re-

*An address delivered at the 35th annual meeting of the Railway Accounting Officers' Association, Richmond, Va., June 13 1923.

porting carriers and it is too often carelessly and unintelligently compiled.

Responsibility for Analysis of Reports

The foregoing comment leads naturally to the second suggestion that steps should be taken by the executive officers to insure the effective utilization of all required accounts and statistics, not only of those required by public regulating authorities, but as well those required locally for the information of heads of departments and their subordinate officers. If, as is often the case, the statistical information compiled in response to the commission's requirements is not utilized and therefore would not be missed if discontinued, that is not an argument for the discontinuance of the reports. It is rather a reflection upon the intelligence of the management of the road. Unfortunately, there are too many instances in which data conscientiously compiled by the accounting department are not analyzed nor used as aids to judgment in managerial control. How many reports, compiled at substantial effort and expense, are received in the general or divisional offices and are checked off for the file with but perfunctory or even with no attention by chief clerks who too often have the conception that it is their duty to keep papers off the chief's desk? I fear that there are too many cases of the kind. Nearly every road has the tradition that such and such reports, compiled for years, were experimentally omitted without authority and as no question was raised, were discontinued and were not missed.

Not long ago, an accounting officer, who had had transportation experience, confided to me that he felt very much discouraged because the operating officers, both general and divisional, took little or no interest in current reports of operating performance, compiled by the accounting department. He had taken pride in developing certain forms which reflected the comparative efficiency of the important elements in maintenance and operation and transportation service, and had the figures shown separately by operating divisions. In addition, he personally had appended a memorandum each month in which the results were analyzed and attention called to important features. Although the general manager approved the form of the exhibit when it was being prepared, so far as the accounting officer could ascertain these statements were never studied nor acted upon by the responsible operating officials and were never passed on to the division superintendents for comment. In that case the general manager and the general superintendents were content to rely upon their powers of personal observation and upon incomplete and inadequate reports inherited from a former generation. Obviously, the comprehensive summary of operating results should have been used as a check on the effectiveness of supervision and as the text for discussion with superintendents and others. Instead they were passed to the file clerk. As a result, in this case and in many other similar cases, information of a character vital to intelligent management lies dormant in the files, and both the effort of compiling it and its potential value as an aid to managerial control are lost.

There is a need of a definite policy supported by the chief executive of each railroad which (1) will insure complete and current statistical information for officers of all ranks, and (2) will hold these officers both of high and of low rank responsible for studying and acting upon the significant figures.

Cooperation Between Accounting and Other Departments

The effectiveness of accounting and statistics as aids to control of expenditures and performance is greatest when there is a sympathetic understanding and mutual co-operation between the accounting and the operating departments. Unfortunately, such co-operation is often lacking because of the failure of each to understand the other's viewpoint. Too many superintendents and others of higher rank have little confidence in figures compiled by the accounting department. They do not understand how they are compiled and they are suspicious of all delayed charges of accounting adjustments which distort the accounts for a particular period. When a superintendent is criticized for an apparently unwarranted increase in his expenses for the month and he finds that a delayed bill for joint facilities, an inventory adjustment, or a charge for back-pay, has burdened the accounts for that month, he often thinks that the accounting departments is in a conspiracy to discredit him. On the other hand, the accounting department frequently has cause for complaint because its instructions are not observed. Ordinarily the grievances are trivial and could be smoothed out if sympathetic, mutual understanding prevailed, but where co-operation is lacking these differences lead to friction and react unfavorably upon both departments.

I believe that beneficial results would flow from a more general adoption of the policy inaugurated many years ago by James J. Hill. A few months before his death in 1916, it was my privilege to spend nearly three months on the Great Northern as Mr. Hill's guest and I conversed with him frequently. His advice to me, then, when we discussed the teaching of transportation, was to emphasize the importance of accounting and statistics. His often repeated statements were: "Intelligent management of railroads must be based upon a complete knowledge of facts. There are too few who know; there are too many who guess. When anyone on the Great Northern begins to guess, he guesses himself out of a job."

Mr. Hill's conception of knowing the facts was to have a high-grade accounting department, concentrate within that department all statistics as well as accounts, support it by executive backing, insure effective co-operation between the accounting and other departments, furnish all concerned with adequate cost and performance statistics, and hold each superintendent and higher officer responsible for results. He set the example himself by always having a complete and uncanny knowledge of detail. The officer who could not keep up with Mr. Hill in his knowledge of facts, and who could not control his ton-mile cost, was unfortunate indeed.

This is not the place to dwell upon the ramification of Mr. Hill's policies of controlling expenditures so as to insure steadily decreasing unit costs. Suffice it to say that he regarded accounting as the chief aid to administration. It is of interest, however, to note how he brought about a mutual understanding and co-operation so that the accounting department was considered by superintendents as a friend at court rather than a prosecuting attorney.

Prospective Superintendents Student Workers in Accounting Department

It had then been the practice for many years (and I understand the practice has been continued) that the understudies for positions as superintendents should spend at least six months as student-workers in the accounting department in St. Paul. These men were taken in squads of six and were put through a systematic course of training which included the actual performance of work at each of the many desks in the disbursement, capital expenditures, equipment service, and other branches of the accounting department. Besides, they were called upon to study the classifications and to attend evening lectures and examinations by Mr. Martin, then comptroller, now executive vice-president.

I remember observing one big-fisted trainmaster hard at work during the day making the distribution of charges on vouchers covering additions and betterments, and the same evening reciting his understanding of the account "Stock discount extinguished through income." It was hard work for one accustomed only to outdoor work and acquainted only

with the language of the transportation department, but he gained a knowledge which was extremely valuable to him later when he became a superintendent and as such had local jurisdiction over the division accountant in his office. He had a clearer conception of the whole field of accounting and could orient the detail figures in his own divisional statement with those of other divisions and with the road as a whole. There was then no mystery about the technique of the operating statements and therefore no alibis.

Under the Great Northern plan the divisional accounting was decentralized and the divisional accountant, although under control of the accounting department as to accounting procedure, was a member of the superintendent's staff. The experience in the accounting department made it very much easier for the superintendent to supervise the accounting work of his division. His own results, with certain minor exceptions, were compiled in his own office and were known to him before he received the final statement for the road as a whole. There was no evasion of responsibility since the superintendent had primary jurisdiction over the compilation of the data.

As already stated, it is my opinion that much good would come from the general adoption of the Great Northern plan. It would break down prejudices, prevent misunderstanding, and give the accounts and statistics, both for the divisions and districts, and for the road as a whole, a more vital and compelling force.

Conclusions

In conclusion then, may I repeat:

(1) Fault should not be found with the accounting requirements of the Interstate Commerce Commission. The commission requires nothing that the railroads should not have for their own information. In view of its large powers, particularly those recently vested in it by the transportation act, the commission has been moderate and reasonable in its demands. It might properly go further than it has gone and aid the backward railroads by forcing them to know more about their own affairs.

(2) The chief executives of the railroads should adopt and enforce a policy under which all necessary statistical data should be furnished by the accounting department and all concerned should be held responsible for noting and acting upon significant items.

(3) To insure a better understanding between the operating and the accounting departments it would be well to bring about a more general adoption of the Great Northern plan of having prospective superintendents undergo a course of training in the central offices of the accounting department.

Colorado & Southern an Exception in Colorado

Now Pays Dividends on All Three Classes of Stock—Has Better Prospects than Neighbors

THE SITUATION of the railway lines in the state of Colorado in recent years has not been exactly a happy one. Outside of the systems reaching Denver and Pueblo from the east—including the Burlington, Rock Island, Union Pacific, Santa Fe and Missouri Pacific, which depend to but a comparatively small extent upon their Colorado traffic—most of the lines serving the state have been confronted with adversity. There have been several instances of lines which have had to abandon operation because of lack of traffic or other difficulty. A large share of the state's mileage is in the hands of receivers. There is one outstanding exception in this situation, namely, the Colorado & Southern. This line extends north and south through the center of Colorado and now pays regular dividends on all its issues of stock and has a good credit condition. The Colorado & Southern lines extend from a junction with the Chicago, Burlington & Quincy at Orin, Wyo., south across Colorado and then southeastward across the northeast corner of New Mexico and the panhandle of Texas to Fort Worth. As a result the system offers the only route from Colorado southeast towards the Gulf. Practically all of the other lines in this territory extend from the neighborhood of Kansas City or St. Louis southwestward. The Colorado & Southern crosses them at right angles.

The Colorado & Southern lines are in three parts and the earnings and operating statistics applying to them are reported separately. This makes it somewhat more difficult to secure an adequate picture of the system's operations than if combined figures were reported for the system but, of course, the fact that details are available for each of the three separate companies is not without its value in other respects. That part of the system which lies in the states of Wyoming, Colorado and New Mexico is operated by the parent Colorado & Southern. The Fort Worth & Denver City operates the line across the panhandle of Texas to Fort Worth, and the Wichita Valley lines include the Wichita Valley, extending southwestward from Wichita Falls, and its subsidiaries. The Trinity & Brazos Valley, extending from Fort Worth to Houston and giving the Colorado & Southern lines their outlet to the Gulf of Mexico, is controlled jointly with the Rock Island. This property, unfortunately, operates consistently at a deficit and its value to the Colorado & Southern is apparently not as great as one might be led to expect from its location on the map. While the Colorado & Southern lines offer a through route from Colorado southeastward to the Gulf of Mexico, it does not appear that the system handles any very great amount of through traffic. It is true that it supplies an outlet for such grain as might move from Burlington territory in Wyoming and there is also a fair volume of lumber moving from the Northwest.

The Colorado & Southern, speaking of it now as one of the three separate units of the Colorado & Southern lines, serves the various industrial areas of the state of Colorado, notably those centering on Denver, Pueblo and Trinidad. The larger part of the road's tonnage is products of mines, the commodities in that group in 1922 embracing 65 per cent of the total tonnage; bituminous coal was 52 per cent. Manufactures constituted 12.94 per cent and products of agriculture, 13.25 per cent. The Fort Worth & Denver City in 1922 carried 25.66 per cent products of agriculture and 27.74 per cent products of mines, including 17 per cent bituminous coal. Manufactures made up 33.5 per cent. One of the most important commodities carried by the Fort Worth & Denver City is petroleum and its products. The oil traffic is a comparatively new development in its territory. This is indicated by the fact that in 1918 the tonnage of petroleum and its products totaled 195,532 or 7.5 per cent of the total revenue tonnage in that year. In 1920 the figure suddenly arose to 461,177, or 13.4 per cent. Conditions in 1922 were not quite as favorable as they were in 1920,

but the tonnage totaled 414,199 or 15.86 per cent of the total.

The conditions on the Colorado & Southern in 1922 were not particularly favorable. A joint income statement for the three lines shows a net income available for dividends of $1,737,276, which compared with $3,803,931 in 1921. The figures show a decrease as compared with 1921 of 7.43 per cent in operating revenues, of but 3.02 per cent in operating expenses and of 35.23 per cent in net railway operating income. The Fort Worth & Denver City seems to have suffered the most of the three lines. This company did extremely well in 1921. In 1922 of the total decrease in operating revenues of $1,952,526, $1,617,921 represented the decrease suffered by that line. The reason for the difficulties of 1922 are given as prolonged drought in Texas and New Mexico which not only reduced the tonnage of agricultural products but also limited the purchasing power of the agricultural population and curtailed the inbound movement of merchandise, implements and miscellaneous traffic and restricted passenger travel on the lines materially. The reduction in oil traffic is attributed to a marked drop in the price of oil which retarded the drilling of wells and development generally. Metal mining and steel production in Colorado were not particularly prosperous. It is hardly necessary to refer to the effect on operating expenses of the railway shopmen's strike or to refer to the reductions in rates.

The standard return of the three Colorado & Southern lines was established as $4,724,965. In 1921 the system exceeded this pre-war average by $1,000,000, the figure for the year being $5,775,312. In 1922, however, the net operating income for the system was but $3,740,484. It may be of interest to point out that the standard return for the Colorado & Southern, itself, was $2,481,212. In 1921 net operating income totaled $1,903,795 and in 1922, $1,061,877. The Fort Worth & Denver City, which operates less than one-half the mileage of the Colorado & Southern, had a standard return of $1,891,386. Its net operating income in 1921 was $3,457,112; in 1922, $2,360,249. At this writing the Colorado & Southern does not seem to be, as yet, back to its proper stride. For the first three months of the year it had a net operating income of $35,913 and an operating ratio of 92.9. For the first three months of 1922 its net operating income was $369,958. The Fort Worth & Denver City shows a net operating income for the first three months of 1923 of $496,119 as compared with $465,606 for the same period last year. Its operating ratio for the first three months was 75.3. The Colorado & Southern suffers at present from what appears to be an unsatisfactory power situation, its percentage of locomotives held for repairs requiring over 24 hours on April 15 being 25.9. The Fort Worth & Denver City on the same date reported that 20.9 per cent of its locomotives were being held for repairs.

The statement was made that the Trinity & Brazos Valley, in which the Colorado & Southern has one-half interest, had shown a deficit consistently. The situation of this road offers interesting commentary upon the effect of oil as a revenue producer for a railroad. The year 1921 saw the exploitation of the Mexia oil field through which the Trinity & Brazos Valley runs. In that year the oil and its corollary traffic enabled the road to report a net operating income for the first time, its net being $288,066 as compared with a deficit in 1920 of $645,513. Development of the Mexia field has since led to the installation of pipe lines; as a result the Trinity & Brazos Valley has lost a good share of its crude oil traffic. In 1922 it again suffered a deficit, this time of $13,857. The new Teapot Dome oil field of Wyoming recently opened to exploitation in the neighborhood of Casper is not far from the northern end of the Colorado & Southern. It is, as yet, too early to determine what the Casper field may amount to. It will be interesting to observe whether the work in this field may have any effect on the situation of the Colorado & Southern.

The essential strength of the Colorado & Southern lines has been indicated in the foregoing. The road is now paying dividends on all its classes of stock, the rate of 4 per cent on its first and second preferred issues having been on a regular basis since 1917. The common stock received 3 per cent in 1921 and again in 1922. The dividends on the two issues of preferred totaled $680,000 and on the common, $930,000.

M. of W. Wage Increase Hearing Begins

THE FIRST RAILROAD LABOR BOARD HEARING on a wage increase petition of national importance to be considered this year was opened in Chicago on June 11 when the dispute between the Brotherhood of Maintenance of Way Employees and Railway Shop Laborers and 24 roads operating in all parts of the country was presented for arbitration. When the hearing opened, it was evident that the labor organization would base its plea for increased wage schedules on the grounds that the cost of living is on the up-grade and that railroad labor is not sharing the general wage increases which have been granted by other industries.

In its opening arguments, brotherhood representatives declared again for the "living wage" as approved by the Bureau of Labor Statistics of the Department of Labor. Reasons for the recognition of such a "living wage" were presented at length, this testimony consuming the entire first day of the hearing.

The increases which the brotherhood is asking, ranging from 8½ to 15 cents an hour, are designed to provide the maintenance-of-way employees and shop laborers with an equivalent of the theoretical "living wage." Although the union will put forth every effort to secure a recommendation from the board that its demands be granted in full, it is doubtful, in view of the nominal increases which have been offered by the managements of other lines and accepted by the union, if the Labor Board will see fit to approve the extreme advances which are sought.

All the individual settlements which have been approved by the brotherhood have been for nominal increases averaging about three cents an hour. The accompanying chart shows in detail the increases which have been granted on many of the lines, up to the day before the hearing opened. It indicates that the brotherhood will be satisfied with increases considerably smaller than it has asked in the case now being heard. In the chart, increases in dollars are monthly advances and increases in cents, hourly increases.

Although more than 30 roads were originally included in the docket now before the board, a number of eleventh hour settlements and withdrawals reduced this number to 24. The defendant roads are: the Chicago Great Western; the Chicago, Indianapolis & Louisville; the Chicago, St. Paul, Minneapolis & Omaha; the Cincinnati, Indianapolis & Western; the Denver & Rio Grande Western; the Fort Smith & Western; the Gulf & Ship Island; the Kansas City Southern and subsidiaries; the Louisville & Nashville; the Louisville, Henderson & St. Louis; the Midland Valley; the Nashville, Chattanooga & St. Louis; the Pennsylvania; the Pittsburg & Shawmut; the San Antonio, Uvalde & Gulf; the Southern Pacific, Pacific System; the Terminal Railroad of St. Louis; the Texas & Pacific; the Texas Midland; the Toledo, Peoria & Western; the Trinity & Brazos Valley; the Western Pacific; the Green Bay & Western and the Kansas City Terminal. Simultaneously with the mainte-

INCREASES GRANTED TO MAINTENANCE-OF-WAY EMPLOYEES

(Increases in Dollars are Monthly Advances; in Cents, Hourly Increases)

Name of carrier	Foremen of mechanics	Assistant foremen of mechanics	Section foremen and assistants	Mechanics	Mechanics' Helpers	Track Laborers	Bridge tenders, pile drivers, pumpers, etc.	Shop Laborers, etc.
A. T. & S. F.	$0.02½	$0.02½	....	$0.02	$0.01	....	$0.01	$0.01
Minimum, $116.16; all above $2.04; assistants	....	....	$0.02½	....	....	....	....	....
Except the G. C. & S. F.	....	....	....	....	....	$0.01	....	....
B. & O.	$10	....	....	$0.04	$0.01	$0.005 to $0.03½ Maximum $0.40	....	....
Pile driver ditching engineer, $10; hoisting engineer, $0.03; coal chute and labor foremen	....	.03	....	....	....	....	....	....
Section, track, maintenance foremen	....	....	$0.01	....	....	....	....	....
Crossing watchmen and lampmen, drawbridge tenders, pumpers, pile drivers and ditching firemen, $5; hoist firemen	....	....	....	....	....	....	$0.03	....
B. & A.	....	....	.02	....	....	$0.02	....	$0.02
B. & M.	....	....	.03	....	....	$0.03	....	$0.03
P. R. & P.	$.980	....	....	$0.04	....	$0.03 hr.	....	....
Fence gang and ditcher foremen, $9.80; ditching and derrick engineers, $10; pile driver engineers, minimum	....	.70	....	....	....	....	....	....
Section and extra gang foremen, $9.80 assistant track foremen, minimum	....	....	$112	.04	....	....	....	....
Carpenter helpers, $0.01 mason helpers, $0.03½	....	....	....	....	....	....	$0.03 hr.	....
Pumpers, $5.12; P. D. firemen $6.12; watchmen	....	....	....	....	....	....	$3.12	....
C. of G.	$5	$5	$5	$0.02	....	....	....	....
Track labor, $0.18; bridge and building labor	....	....	....	....	....	$0.25	....	....
C. of N. J.	$0.02	....	....	$0.02 to $0.04	$0.03	....	....	....
Section foremen	....	....	$5	....	....	....	....	....
Common labor	....	....	....	....	....	$0.03	....	....
C. & E. I.	$4.08	$0.02	....	$0.58	$0.01	$0.005	....	....
Track foremen	....	....	$4.08	....	....	....	....	....
Minimum, $0.58; one or more years' experience, $0.60; Chicago, Ill., St. Louis Division minimum, $0.57; one or more years' experience, $0.59; Evansville Division	....	....	....	....	....	.005	....	....
Section laborers $0.01	....	....	....	....	....	....	$0.01	....
Pumpers and crossing watchmen	....	....	....	....	....	....	....	$0.01
C. C. C. & St. L.	....	....	....	$0.04	....	$0.03	$3.00	....
Track foremen, maximum	....	....	$5	....	....	....	....	....
C. R. I. & P.	$0.02½	$0.02½	$0.02½ to $2.04	$0.02	$0.01	$0.01	$0.01	$0.01
F. E. C.	$5 to $11.80	$5 to $11.80	....	....	....	....	....	....
Section foremen	....	....	$10.92	....	....	....	....	....
Painters	....	....	....	$0.0025 to $0.075	....	....	....	....
Georgia	$9.70	$12.80	....	....	....	....	$1.94 to $19.06	....
Section foremen, $6.22 to $13.72; apprentice section foremen	....	....	$0.02	....	....	....	....	....
G. N.	$10	$10	....	$0.0325	$0.02	....	....	....
Section foremen within Twin City terminal, $8.84; outside, $5.84; Assistant section foremen	....	....	$0.03	....	....	....	....	....
Twin City terminal less than year, $0.03; year or more, $0.04; outside of Twin City terminal: less than year, $0.02; year or more	....	....	....	....	....	$0.03	....	....
Pumping engineers and pumpers, ditching, hoisting and pile driver firemen, $6.12; drawbridge tenders and assistants, crossing watchmen or flagmen, lamplighters and tenders	....	....	....	....	....	....	$0.03	....
G. C. L.—Houston Belt & Terminal.	$5	....	....	....	....	....	....	....
Section and extra gang foremen	....	....	$1.84 to $4.84	....	....	....	....	....
Carpenters and painters	....	....	....	$0.02	....	....	....	....
Carpenter and painter helper	....	....	....	....	$0.01	....	....	....
Section laborers, $0.01	....	....	....	....	....	....	....	....
Lamp tenders, $1.12 to $1.52; pumpers, $0.12; watchmen	....	....	....	....	....	....	$1.12	....
G. M. & N.	....	....	....	....	....	....	....	....
Extra gang laborers, $0.02; yard section laborers, $0.02; line section foremen	....	....	....	....	....	$0.02½	....	....
L. V.	....	....	....	....	....	$0.03	....	....
L. I.	....	....	....	....	....	$0.03	....	....
M. & I. Big Fork & Int'l. Falls	$10	....	$6.84	$0.03¼	$0.01	$0.02	$0.01 to $0.03	....
M. & St. L.	$0.02 to $10	....	....	....	....	$0.01	$0.01	$0.01
N. Y. C.	....	....	....	$0.0025 to $0.04	$0.01 to $0.03	$0.01 to $0.03½	$2.76 to 14.34	$0.0125 to $0.085
Pile driver, ditching and hoisting engineer, $10.20; coal dock foremen, $6; fence foremen	....	$4.80	....	....	....	....	....	....
Section, track and maintenance foremen, $2.80 to $12.80; assistant section foremen	....	....	$0.01	....	....	....	....	....
N. Y., N. H. & H.	....	....	....	$0.04	$0.02	....	....	....
Carpenters, bridge men and painter foremen, $0.63 to $160; mason foremen, from $0.65 to	$165	....	....	....	....	....	....	....
N. S., $0.02 to	$5.84	....	....	....	....	....	....	....
Section foremen, $0.02; gang foremen, $0.02; section foremen	....	....	$6.76	....	....	....	....	....
N. P.	$10	$0.03½ to $6.84	$6.84	$0.03¼	$0.01	$0.02	$0.01 to $0.03	....
P. M.	....	....	....	....	....	....	....	....
Section foremen, $1.84 to $14.34; minimum, $112.50; maximum	....	....	$135	....	....	....	....	....
Track laborers, $0.02¾; laborers, shops and roundhouses	....	....	....	....	$0.01	$0.02½	....	....
P. & R.	....	....	....	$0.02 to $0.03	$0.01 to $0.04	$0.01 to $0.03	....	$0.02
Sub-foremen	....	....	$0.01	$0.02 to $0.04	....	....	....	....
P. & L. E.—Lake Erie & Eastern	....	....	....	$0.04	$0.01	$0.03	....	....
Pile driver, ditcher, and hoisting engineers, coal chute foremen, $0.05; fence gang foremen	....	$5	....	....	....	....	....	....
Section, track and maintenance foremen, $5; assistant foremen	....	....	$0.01	....	....	....	....	....
Pumpers, $5.12; ditcher and rotary firemen and lampmen, $0.03; watchmen	....	....	....	....	....	....	$3	....

Name of carrier	Foremen of mechanics	Assistant foremen of mechanics	Section foremen and assistants	Mechanics	Mechanics' Helpers	Track Laborers	Bridge tenders, pile drivers, pumpers, etc.	Shop Laborers, etc.
Rutland	....	....	....	$0.03	$0.01	....	....	....
Track laborers, $0.0275; laborers, shops and roundhouses	....	....	....	....	....	$0.02½	....	....
St. L. S. F.	$0.01	$0.01	$0.01 to $0.03	$0.01	$0.005	....	....	....
				....	....	$0.01	....	....
Section laborers	$0.01	....	....	....	....	....	....	....
Pumpers and crossing watchmen	....	....	....	....	....	....	$0.01	....
S. A. L.	....	....	....	....	.... Minimum	$0.22	....	....
					Maximum	$0.25	....	....
Crossing watchmen, bridge tenders, assistants and pumpers	....	....	....	....	....	....	$0.02½ to $0.03	....
S. A. & A. P.	$5	$0.02 to $5	$0.02	$0.01	$0.01 to $0.03	$6.12	$0.01½	....
Wabash	....	$4.00 to $17.00	$0.04 to $0.09	....	$0.005 to $0.04	....	....	....

INCREASES GRANTED CLERICAL AND STATION EMPLOYEES

Name of carrier	Supervisory forces	Clerks (experienced)	Clerks (inexperienced)	Callers, etc.	Janitors, watchmen, etc.	Office boys	Freight handlers	Truckers	Common laborers
B. R. & P.	....	....	....	....	....	....	$0.02	$0.02	$0.02
C. of N. J.	$0.03	....	....	....	....	....	.02 to	....	.02
Less than 2 years' seniority, $0.01; 2 years' to 10 years' seniority, $0.02; 10 years or more	....	$0.03	$0.03	....	....	....	.04	....	....
L. I.	....	....	....	....	....	$0.03	.01	.03	....
L. & N.	.03	.03	.01	....	....	....	....	....	....
Train and engine crew callers	....	....	....	$.02	....	....	....	....	....
N. S.	.02	.02	.02	.02	$0.02	.02	.02	.02	....
P. & R.	....	....	.02	.02	.02	....	.01	.01	.01
R. F. & P.	....	....	....	....	....	....	....	....	....
Paggage porters and mail handlers	....	....	....	.03 hr.	....	....	....	....	....

nance-of-way case, the dispute between the Brotherhood of Railroad Station Employees and the Boston & Albany, the Boston & Maine, the Boston Terminal, the Maine Central and the Portland Terminal will be heard.

New Wage Increases Granted

Six roads, the Chicago & Northwestern, the Chicago, Milwaukee & St. Paul, the Missouri Pacific, the Illinois Central, the Kansas, Oklahoma & Gulf and the San Antonio & Aransas Pass, granted last minute increases to their maintenance-of-way employees before the opening of the hearing. These increases were approximately the same as those previously negotiated on other lines. Bridge and building foremen on the Northwestern received monthly increases ranging from $2.50 to $12.50; section foremen received an increase of $5 a month; assistant section foremen, five cents an hour; and mechanics and laborers, from one to four cents an hour. The increases on this road affect approximately 15,000 employees.

The Missouri Pacific granted increases to its 8,000 maintenance-of-way employees, including advances of from $5.80 to $10 a month to section foremen; three cents an hour to mechanics; and from one to two cents an hour to laborers. The increases on the Illinois Central, which affect 13,800 employees, are as follows: Section foremen, $5 a month; mechanics, three cents an hour; laborers, ½ to 1½ cents an hour.

Maintenance-of-way employees on the San Antonio & Aransas Pass received the following increases: Bridge and building foremen, $5 a month; section foremen, $5 a month; assistant section foremen, two cents an hour; mechanics, two cents an hour; mechanics helpers, one cent an hour; track and shop laborers, one to three cents an hour; drawbridge tenders and helpers $6.12 a month; and stationary engineers, two cents an hour.

The settlements negotiated by the Chicago, Milwaukee & St. Paul and the Kansas, Oklahoma & Gulf were approximately the same as those on the other roads.

In addition to the maintenance-of-way settlements, other increases which have been granted were announced. The Pennsylvania has authorized general increases to 112,000 of its employees which will involve an aggregate annual payroll increase of $8,579,000. Maintenance-of-way employees received increases of from one to three cents an hour; signal department employees, five cents an hour; shop employees, three cents an hour; station and warehouse employees, from one to three cents an hour; and stationary engineers and boiler room employees, two cents an hour.

The Pittsburgh & West Virginia and the West Side Belt ordered wage increases to their shopcrafts employees amounting to three cents an hour. The Washington Terminal has granted a three-cent an hour increase to its maintenance-of-way employees and the same amount to its shopcrafts workers.

The Wabash has granted wage increases to 3,500 of its maintenance-of-way employees as follows: Section foremen, $4 to $17 a month; mechanics, four to nine cents an hour; and common labor, one-half to four cents an hour.

Chicago, Rock Island & Pacific has granted an increase to its coach cleaners, mechanics' helpers and apprentices.

Recent submissions to the board include several new maintenance-of-way petitions as well as disputes involving other classes of employees. The Brotherhood of Maintenance-of-Way employees filed a dispute with the Missouri-Kansas-Texas requesting the following increases: Mechanics, four cents an hour; mechanics' helpers, three cents an hour; track laborers, three cents an hour; drawbridge tenders, three cents an hour and shop laborers, three cents an hour. The same organization filed a dispute with the Southern Pacific lines in Texas and Louisiana for the following increases: Bridge and building foremen and assistants, 15 cents an hour; track foremen and mechanics, 14 cents an hour; mechanics' helpers, 8½ cents an hour; track laborers, 11½ to 15 cents an hour; drawbridge tenders, pumpers and watchmen, 11 cents an hour. The maintenance-of-way brotherhood has also presented a petition to the board for increases for the employees it represents on the Delaware, Lackawanna & Western. The increases requested on this road are similar to those already submitted on other lines.

INCREASES GRANTED TO SHOP EMPLOYEES

Name of carrier	Supervisory forces	Machinists, etc.	Apprentices and helpers	Car cleaners
P. & O.	$0.03	$0.03	$0.03	$0.03
P. C.	...	.03	.03	...
N. C. & St. L.	...	*.02	.02	...
N. O. G. N.	.02 to .12	.02 to .12	.02 to .12	...
P. & R.	...	.04	†.04	.03
	...	...	‡.03	...

*Except freight car truckmen. †All apprentices. ‡All helpers.

The Order of Railroad Telegraphers has filed a dispute with the Chicago, Milwaukee & St. Paul, involving the elimination of fractional rates, the establishment of a basic minimum of not less than 60 cents an hour, special consideration for terminal and relay positions and the adjustment of the differentials which now exist as between the different divisions, these adjustments to be made on the basis of an average rate of 72 cents per hour for the entire system. The American Train Dispatchers have filed a dispute with

the Pere Marquette asking that trick dispatchers be paid $275 a month. Clerical employees on the Boston & Maine, which are represented by the Brotherhood of Railway and Steamship Clerks, have appealed to the board for wage increases of 16 per cent and an equalization of other rates. This brotherhood is also involved before the board in a dispute with the Southern Pacific, Pacific System. The following increases are asked: Storekeepers, chief clerks and other supervisory forces, 9 cents an hour; clerks, 9 to 13 cents an hour; callers, 13 cents an hour; janitors and watchmen, 14 cents an hour; office boys, 9 cents an hour; freight handlers, 8 cents an hour, and common laborers, 7½ cents an hour.

The Brotherhood of Railway Signalmen of America has presented a petition for a submission to the board, asking that the wage rate of signalmen and signal maintainers on the Atlantic Coast Line be icreased to 85 cents an hour and that the rate of helpers be increased to 60 cents an hour.

Other Labor Developments

Several other interesting developments in the labor field have materialized during the past week. Fifty organizers of the Brotherhood of Railway Trainmen have begun a vigorous campaign to enroll all of the 9,000 yardmen in the Chicago district, in anticipation of a fight for increased wages to be inaugurated next October. Initiation fees in the union will be suspended for a period of 60 days and a special effort will be made to win back every man who took part in the outlaw switchmen's strike of 1920.

Approximately 500 freight handlers, elevator men and checkers employed in the Bush terminal in South Brooklyn, N. J., went on strike on June 8 for a standard scale of wages to replace the present tonnage basis and recognition of their union. The men have been receiving 60 to 65 cents a ton for moving freight and are asking a straight wage of $6 a day. The officers of the company have announced their intention of fighting the strike and employing new men to replace the strikers.

The Labor Board added another paragraph to the history of its dispute with the Pennsylvania over employee representation, when it recognized the right of the general chairman of the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers to represent the maintenance men on the Pennsylvania in matters of dispute. The Labor Board has also cited the Denver & Rio Grande Western for refusing to employ shop foremen who were discharged last summer after refusing to act as strike breakers. In that case the board ruled that under the agreement the road had no right to require the foremen to work as strike-breakers and ordered their reinstatement. The road maintains that it cannot obey the reinstatement order as it has employed new foremen with promises of permanent employment.

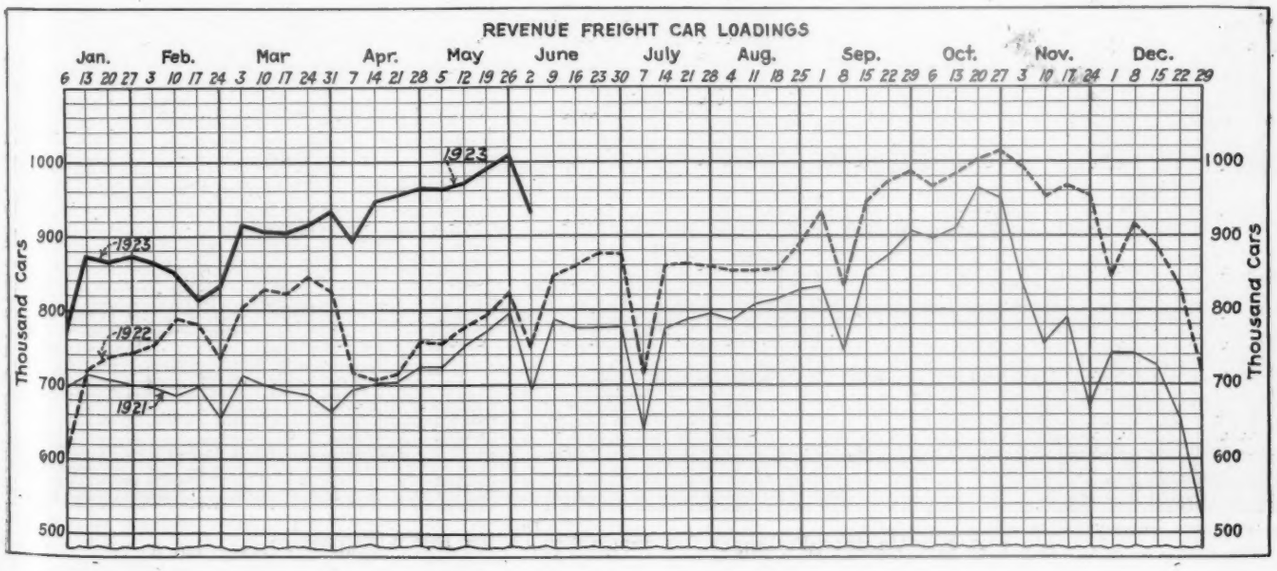
The hearing on the petition of the Kansas City, Mexico & Orient for restoration of the wages in effect prior to May 1, 1920, was held before the Labor Board on June 6. The chief bone of contention was the question as to whether the carrier's ability to pay the current rate should be considered by the Labor Board in passing on the road's plea. A precedent on this question was established by the board in the New Orleans & Great Northern case, in which it granted relief by a reduction of the wages to below the going rate. Representatives of the Orient emphasized the need for granting the road all possible assistance in order to avoid suspending operation.

Record Car Loading Accompanied by Car Surplus

WASHINGTON, D. C.

FREIGHT CAR LOADING during the week ended on June 3 fell off as compared with the high figure reached the week before, because of the Memorial Day holiday. The total was 932,041 cars, which, however, was 192,482 more than were loaded during the corresponding week of last year and 238,138 more than during the corresponding week of 1921. On the assumption that loading on May 30 was the equivalent of one-half of a regular working day the average loading per day was 169,462 cars, which exceeded the average for the week of May 26, when 1,014,029 cars were loaded. The daily average for that week was 169,005 cars. Because of the holiday loading of all classes of commodities except ore was less than that during the preceding week. As compared with the corresponding week of last year increases were shown as to all classes except grain and grain products.

The Car Service Division has issued a compilation of the loading for the first 21 weeks of the last five years. Total car loading for this year to May 26 amounted to 19,035,772 cars, which was 2,043,792 cars or 12 per cent greater than the loading for the same period of 1920, the previous record loading year. As compared with last year the increase was 20 per cent. Loading of livestock, coal,



coke, forest products and l.c.l. merchandise and miscellaneous freight exceed the loading for the corresponding periods of 1919, 1920, 1921 or 1922, while the loading of grain and grain products was exceeded only during 1922. Ore loading this year has been slightly behind that of 1919 and 1920 but far in excess of 1922 and 1921.

That the railroads are now prepared to handle an even greater volume of traffic, in spite of the record loading that has been made for several weeks, is indicated by the fact that the car surplus has now exceeded the reported shortages for two weeks. During the week of May 31 the shortage averaged only 16,277 cars, a reduction of 4,308 since May 22 and of 66,650 since January 1, while the surpluses aggregated 32,443 cars, including 15,670 box cars and 3,953 coal cars. During the month of October, 1920, when the car loading broke all records up to that time, the daily car shortage averaged from 55,000 to 75,000 cars. In October, 1922, when the loading was approximately the same as during the week of May 26 this year, the shortage reached 179,000.

CARS OF REVENUE FREIGHT LOADED

Commodity	Total Jan. 6th to May 26th, Inclusive 1923	1922	1921	1920	1919
Grain and grain products	851,012	902,353	789,490	693,383	749,842
Live stock	676,125	600,408	599,151	634,618	666,773
Coal	3,876,259	2,965,376	3,113,482	3,739,392	3,226,871
Coke	316,335	170,902	150,810	223,085	*
Forest products	1,516,814	1,111,624	1,031,660	1,294,721	1,146,299
Ore	462,793	164,431	218,297	475,142	471,240
Merchandise L. C. L., and miscellaneous	11,336,434	9,951,583	8,974,991	9,931,639	8,795,606
Total	19,035,772	15,866,677	14,877,881	16,991,980	15,056,631

*Included in coal.

REVENUE FREIGHT LOADED

SUMMARY—ALL DISTRICTS, COMPARISON OF TOTALS THIS YEAR, LAST YEAR, TWO YEARS AGO. WEEK ENDED SATURDAY, JUNE 2, 1923

Districts	Year	Grain and grain products	Live stock	Coal	Coke	Forest products	Ore	Mdse. L.C.L.	Miscellaneous	Total revenue freight loaded 1923	Corresponding period 1922	1921
Eastern	1923	7,273	2,610	47,387	3,515	6,407	8,960	59,826	88,389	224,367	.....	.....
	1922	8,441	2,608	6,481	1,546	5,205	2,900	61,270	76,900	.....	165,351	164,900
Allegheny	1923	1,900	2,336	53,419	7,425	3,439	14,458	44,652	81,545	209,174	.....	.....
	1922	2,155	2,448	13,710	4,656	2,798	5,185	46,113	63,649	.....	140,714	142,872
Pocahontas	1923	180	117	27,006	434	2,055	252	5,734	4,705	40,483	.....	.....
	1922	207	175	29,378	194	1,435	17	5,456	4,018	.....	40,880	31,708
Southern	1923	3,011	2,293	20,332	1,416	23,414	1,553	35,365	41,144	128,528	.....	.....
	1922	3,162	2,354	23,170	716	18,617	1,174	33,710	39,137	.....	122,040	107,219
Northwestern	1923	9,033	8,707	6,567	1,084	19,169	44,565	27,196	36,002	152,323	.....	.....
	1922	10,957	7,547	7,692	1,448	16,022	18,991	26,231	30,263	.....	119,151	101,292
Central Western	1923	7,738	10,536	12,495	388	11,535	3,233	30,767	47,979	124,671	.....	.....
	1922	9,430	9,938	3,852	228	6,902	2,303	30,939	38,537	.....	102,129	92,865
Southwestern	1923	3,205	2,800	4,042	127	7,618	369	12,846	21,488	52,495	.....	.....
	1922	3,303	2,164	2,006	136	7,000	650	12,616	21,419	.....	49,294	53,047
Total West. Dists.	1923	19,976	22,043	23,104	1,599	38,322	48,167	70,809	105,469	329,489	.....	.....
	1922	23,690	19,649	13,550	1,812	29,924	21,944	69,786	90,219	.....	270,574	247,204
Total all roads	1923	32,340	29,399	171,248	14,389	73,637	73,390	216,386	321,252	932,041	.....	.....
	1922	37,655	27,234	86,289	8,924	57,979	31,220	216,335	273,923	.....	739,559	.....
	1921	40,077	23,340	136,367	4,620	47,645	28,142	195,096	218,616	.....	.....	693,903
Increase compared	1922	.....	2,165	84,959	5,465	15,658	42,170	52	47,329	192,482	.....	.....
Decrease compared	1922	5,315	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Increase compared	1921	.....	6,059	34,881	9,769	25,992	45,248	21,290	102,636	238,138	.....	.....
Decrease compared	1921	7,737	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
June 2	1923	32,340	29,399	171,248	14,389	73,637	73,390	216,386	321,252	932,041	739,559	693,903
May 26	1923	35,522	31,777	192,092	15,000	79,339	70,119	243,834	346,346	1,014,029	806,877	795,335
May 19	1923	33,806	31,274	181,599	15,470	77,653	67,057	244,325	340,613	991,797	780,953	770,991
May 12	1923	31,997	29,689	175,158	15,302	74,424	59,619	243,544	344,798	974,531	767,094	751,186
May 5	1923	34,097	33,508	175,866	15,100	72,154	37,943	240,845	351,516	961,029	747,200	721,722

Compiled by the Car Service Division, American Railway Association.

A Non-Corridor Passenger Car for Service on the Dutch Railway

Agitation Against Railroads an Assault on All Business

IF THE RAILROADS are not successful in holding the first line of defense against advocates of government ownership of the nation's transportation systems, then one by one will other industries be engulfed, said Alfred P. Thom, general counsel for the Association of Railway Executives, addressing the National Association of Credit Men at Atlanta, Ga., on June 12.

"I arraign before your judgment bar," said Mr. Thom, "this constant political agitation against the railroads as an assault on all business and as an attack upon the credit system of the country. If it succeeds, our business progress will be halted and our credit structure will be shaken to its foundations."

Advocates of government ownership, as one means of accomplishing their end, Mr. Thom said, have already inaugurated a campaign to reduce the valuation of railroads "by the simple method of striking off ten billion dollars." Another proposal made by them, he said, is to vest in the several states the power to discriminate unjustly against traffic other than that which moves solely within their own borders, although 85 per cent of the traffic carried by the railroads of the nation is interstate commerce.

"Both of these proposals," Mr. Thom said, "involve disaster to the nation's second largest industry; but disaster cannot come to that industry alone and leave the other great industries of our land or the people themselves unscathed. There can be no such thing as credit, business, or economic isolation of a single essential industry.

"The ten billions of dollars of values which it is proposed to take away from the railroads are somewhere in the credit system of our country. Directly or indirectly, this vast sum is represented in the assets of insurance companies, of savings banks, of business institutions of all kinds, and of a great multitude of individuals. When it is taken away from the railroads, it is automatically withdrawn from the support of the present credit structure."

Mr. Thom cited the following as an illustration of the effect of reducing the valuation as proposed by advocates of government ownership: Estimating the locomotives, passenger trains and freight cars in use on the Class I railroads at even one-half of their present cost would mean that they are worth $4,643,328,800. Add to this, cash working capital and the value of materials and supplies on hand, which would approximate $652,677,192, making a total of $5,296,005,992. Deduct this from the $9,800,000,000 which advocates of government ownership declare to be the proper value of the railroads and there would be left as the value per mile of 241,399 miles of road, a little less than $18,400 to cover the roadbed, tracks, bridges, tunnels, signal and telephone and telephone lines, land, yards and buildings, including shops, roundhouses, stations, terminals everywhere, some of which are located in great cities and are of great value. This he contrasted with the cost to the various states of constructing hard surface country roads, which averages, according to the Department of Public Roads of the Department of Agriculture, $36,801 per mile but which includes only the cost of the actual hard surface road.

"When you take all this into consideration, the monstrous scheme of confiscation proposed by these advocates of government ownership begins to disclose itself," said Mr. Thom.

"We are told that in the early days there were gentlemen, piratically inclined, who made large sums out of trustful investors by a system of railroad wrecking, in which they were said to be past masters. These men were pygmies as compared with the railroad wreckers of today; for the latter, by the simple fiat of a Congress which they hope to control, are seeking to deprive the owners of these properties of ten billions of dollars of the value placed upon them by an independent and informed government tribunal. Thus, the proposal is not only to bring about government ownership of railroads, but to bring it about by confiscating at least half of their value.

"The step from transportation properties to others essential to the public welfare is not a long one, and indications are not lacking that coal and iron and oil and land itself—all fundamentals of industry and of life—are not to be considered immune from the political control which has already been extended over the railroads.

"As to charges that freight rates are too high, I pass by the question whether any particular rate is out of line, or whether the existing scale of rates is higher on the products of any particular industry than it can comfortably bear. A governmental tribunal has been created to deal with these questions and there they may be safely left—there they must be left, unless they are to be relegated to the chaos of frenzied legislation.

"Railroad rates have not prevented the American people from becoming the richest and most powerful nation of the earth.

"They are not at this time preventing or retarding the movement of traffic, for traffic is now moving in greater volume than ever before in the history of the nation, and the rates on which it moves are the lowest in the world.

"Railroad rates, under the heaviest movement of traffic ever known, have not been sufficient to pay a return of as much as 5¾ per cent on the value of the properties devoted to the service of transportation as found by a careful and expert governmental tribunal.

"Railroad rates do not impose upon the products from the average farm as great a financial burden as the farmer's cost of maintenance and upkeep, allowing for depreciation on the basis of a six-year life, of his Ford car, the transportation charges on his farm products averaging at present rates less than $100 and his Ford car costing around $200 per year —or twice as much.

"In the event of government ownership, the railroads would no longer be taxpayers and contribute in the way of taxes to the public treasury, for they would then belong to the government, which does not tax its own property. It would withdraw from the states the power to tax railroad property because they cannot tax property belonging to the federal government. This would mean that more than three hundred millions of dollars per year, now paid by the railroads in the way of taxes, would have to be made up to the state and federal governments from other sources."

Mr. Thom called attention to the loss of $1,200,000,000 suffered by the government during the 26 months of federal control of the railroads during the war. "There is little in this experience," he added, "to justify the hope of lower rates under government management, unless the general taxpayer is to supply the deficiency which the lower rates create, in other words unless the taxpayers are willing to pay a subsidy to support rail transportation which they have refused to pay in support of water transportation."

FOR SEVERAL YEARS efforts have been made to draw up a code for the welding of unfired pressure vessels. Opinions of the best welding experts were not in agreement on many essential points. Fundamental, scientific knowledge, based on test data, was not available. The American Bureau of Welding (Research Department of the American Welding Society), has completed a series of tests on some fifty tanks. The program involved an expenditure of over $15,000. The test data, analysis of same, conclusions and recommendations to the Boiler Code Committee of the A. S. M. E. have been compiled in a report, copies of which may be obtained from the American Welding Society, 33 West 39th street, New York, at $1.50 to members and $5 to non-members.

Oral Argument on Nickel Plate Consolidation

WASHINGTON, D. C.

ORAL ARGUMENT was heard by the Interstate Commerce Commission on June 9 on the application of the New York, Chicago & St. Louis for authority to issue $105,500,000 of stock and for a certificate authorizing it to acquire and operate in interstate commerce the lines now comprising the Nickel Plate and Clover Leaf systems. For the purpose of eliciting expressions the commission had put out a proposed report by Examiner Boles taking the position that the proposed issue would be for an unlawful purpose since the company has not obtained or even asked for authority to consolidate and the commission has not yet completed its final consolidation plan.

Addressing himself to this proposed report W. A. Colston, vice-president and general counsel of the New York, Chicago & St. Louis, said that the company had actually acquired the lines, that the consolidation had actually been consummated under state laws, and that they were being operated by the old companies while the new consolidated company is in a "congealed state" awaiting authority to issue the securities. He contended that as a matter of right and law the company is entitled to the authority sought and that the law relating to consolidations was not intended to prohibit a consolidation which previously would have been lawful. He was supported also by the representatives of the state authorities of Ohio and Indiana, while P. J. Farrell, chief counsel for the Interstate Commerce Commission, contended that consolidations may only be effected after application to and hearing by the commission and a finding that the consolidation is both in the public interest and is in accordance with the commission's permanent consolidation plan.

Mr. Colston pointed out that the application in this case was filed seven weeks ago. "It was carefully prepared and fully supported," he said. "The net practical effects were plain and uninvolved, to wit: The more efficient and satisfactory operation of the lines in the public interest without additional cost and the reduction of securities outstanding in the hands of the public by more than $13,000,000. A plainer case for approval in the public interest cannot be imagined. The case was uncontested and upon every practical and reasonable consideration ought to have come to a favorable conclusion within two weeks after filing. The practical determination of this case should not be longer delayed for legal quibbles; the application ought to be granted on the record made; the congealed corporate status of the applicant ought to be relieved, and if applicant has violated the law it should be prosecuted in a court and under the direction of the attorney general."

Mr. Colston said that statements made by Examiner Boles in the report amount to a direct statement that Congress has exclusively occupied the field of railroad consolidations, has superseded and nullified state consolidation laws and has conferred the sovereign powers of the states in such regard upon the Interstate Commerce Commission. "I say," he contended, "that Congress has not attempted to confer any such power upon the commission and that Congress could not if it would confer such power. Consolidations must be effected by statutory authority. Congress refused to provide for federal incorporation. If Examiner Boles' proposition is true, the state statutes are dead. Therefore if Examiner Boles' proposition is true, there are no means by which the plan of consolidations can be effected when it is made. This assumption is made by the examiner without investigation or knowledge of the facts and without consideration of the evidence in the commission's consolidation hearings. The assumption is pure hypothesis, the hypothesis is not true and the foundation of the examiner's report is more moonshine."

Commissioner Hall remarked that the commission operates through the carriers and that no action the commission could take could make a living state statute dead. "That's our position," said Mr. Colston. "We have consolidated under state law and you can't unconsolidate us. You have let the big fellows go ahead and consolidate, for when you permit a lease for 999 years that is nothing but ownership and there are 17 or 18 cases in which you have authorized what amounts to consolidation, but when we come along and try to grow up to them you hold us up. If permitting a consolidation in advance of the completion of the plan is going to interfere with it you have done it many times."

Chief Counsel Farrell took the position that Congress, having prescribed the means by which consolidations might be effected, had excluded other ways and that the company should have come to the commission with an application under section 5 of the interstate commerce act for authority to consolidate properties for management and operation as a single system. He also expressed the opinion that the commission, after a proper application, might grant the authority in advance of the completion of the final plan if it were reasonably certain that it would not interfere with the plan. If consolidations may be effected under state laws, he said, the states could render it impossible for the commission to carry out the intention of Congress as to a complete consolidation scheme. As to the application for authority to issue securities, he said, it is not necessary for the commission to make an extensive investigation because until the consolidation may be made lawfully securities cannot lawfully be issued for the purpose.

Ray W. Clarke and George W. Brown also argued various points of the case. Mr. Clarke said that a distinction should be made between consolidations which were not unlawful before the transportation act was passed and those which were unlawful. Mr. Brown took the position that the entire theory of the new law is permissive rather than prohibitory.

Zapon Vestibule Curtains

THE ZAPON LEATHER CLOTH COMPANY, Wilmington, Del., is supplying the Pullman Company and various railroads with vestibule curtain material made up in 63½ in. width and 60 yd. rolls. To make a curtain a piece is cut off corresponding to the width of curtain required; the width of the material is sufficient to supply the necessary standard height of 63½ in. The curtains are thus of one piece without sewing or splicing.

The material has a heavy duck backing and is heavily coated to withstand the hard wear incidental to the service to which it is exposed. A further advantage of the form in which this material is now furnished is that the goods have a selvage edge at the top and bottom which prevents ravelling and does away with the pleating along the edges which is necessary when a material without a selvage edge is used.

THE RAILWAY AND LOCOMOTIVE HISTORICAL SOCIETY, Brookline, Mass., has issued its fifth bulletin. It contains interesting descriptive matter and numerous engravings of old photographs concerning the early railroads of Kentucky, the Central Pacific and the Boston & Providence. There is a list of the first 168 locomotives built by the Amoskeag Manufacturing Company of Manchester, N. H. The latest number is dated June 12, 1853. Besides New England roads, these shops supplied locomotives for the Michigan Central, the Buffalo & State Line, the Hudson River, and the Aurora (Illinois) Branch.

New And Improved Devices For Locomotives And Cars

Some Unusual Applications of Franklin Automatic Wedges

IN THE DESIGN of automatic driving box wedges, as usually applied by the Franklin Railway Supply Company, New York, the spring operates directly on the wedge bolt and is placed underneath the pedestal binder. There are, however, many locomotives with small-sized driving wheels where

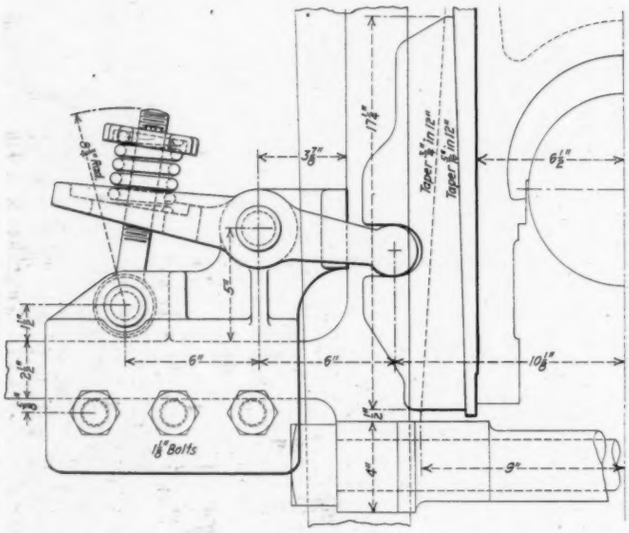


Fig. 1—Arrangement Employed on Locomotives with Small Wheels or Underhung Spring Rigging and with Thimble Type Pedestal Binders

the clearance between the binder and the rail is not sufficient to permit such an application. There also are a considerable number of locomotives having thimble binders which make it impossible to employ the standard spring arrangement. In such cases as well as in some others it is necessary to resort

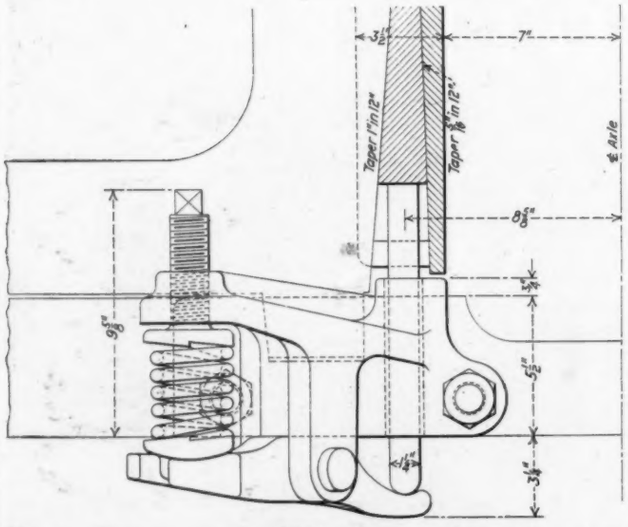


Fig. 2—Arrangement on Mallet Type Locomotives of the Bingham & Garfield

to special spring arrangements to take care of the peculiar conditions. A few of the unique designs of automatic driving box wedges that have been made recently to meet unusual locomotive conditions are shown in the illustrations.

The arrangement shown in Fig. 1 is one that has been used on a number of small 10-wheel locomotives having pedestal binders of the thimble type. As will be noted, a lever has been introduced between the wedge and the operating spring. One end of the lever is forked in order to straddle the frame and engage with slots on extended lips added to the wedge. The lever and fulcrum pin of the spring bolt are carried on a cast fulcrum bracket which is bolted to the frame, being held by three bolts. The bolts are located just beneath the lower rail of the frame and thus do not weaken it. On other locomotives a boss for the lever fulcrum pin has been welded to the frame. Where more convenient, the spring bolt may be forked and straddle the lower rail of the frame with the spring bolt fulcrum pin carried in a bracket held by the cross-tie bolts. Arrangements of this kind dispense with additions below the frame and thus are suitable for engines with small wheels or those having underhung spring rigging.

The arrangement shown in Fig. 2 was used on some Mallet locomotives of the 0-8-8-0 type on the Bingham & Garfield. In this case the space occupied underneath the frame was reduced to a minimum by the introduction of a lever and a rail clearance of from 6⅛ in. to 6⅜ in. was thus secured. The

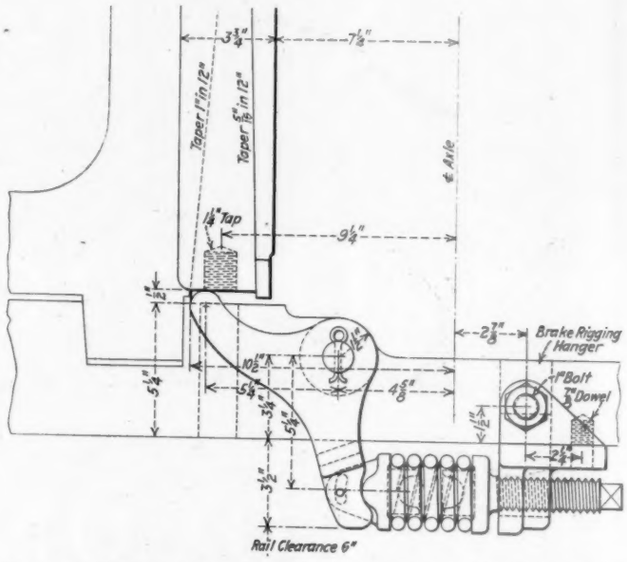


Fig. 3—Bellcrank Lever and Horizontal Adjusting Spring Give Ample Rail Clearance

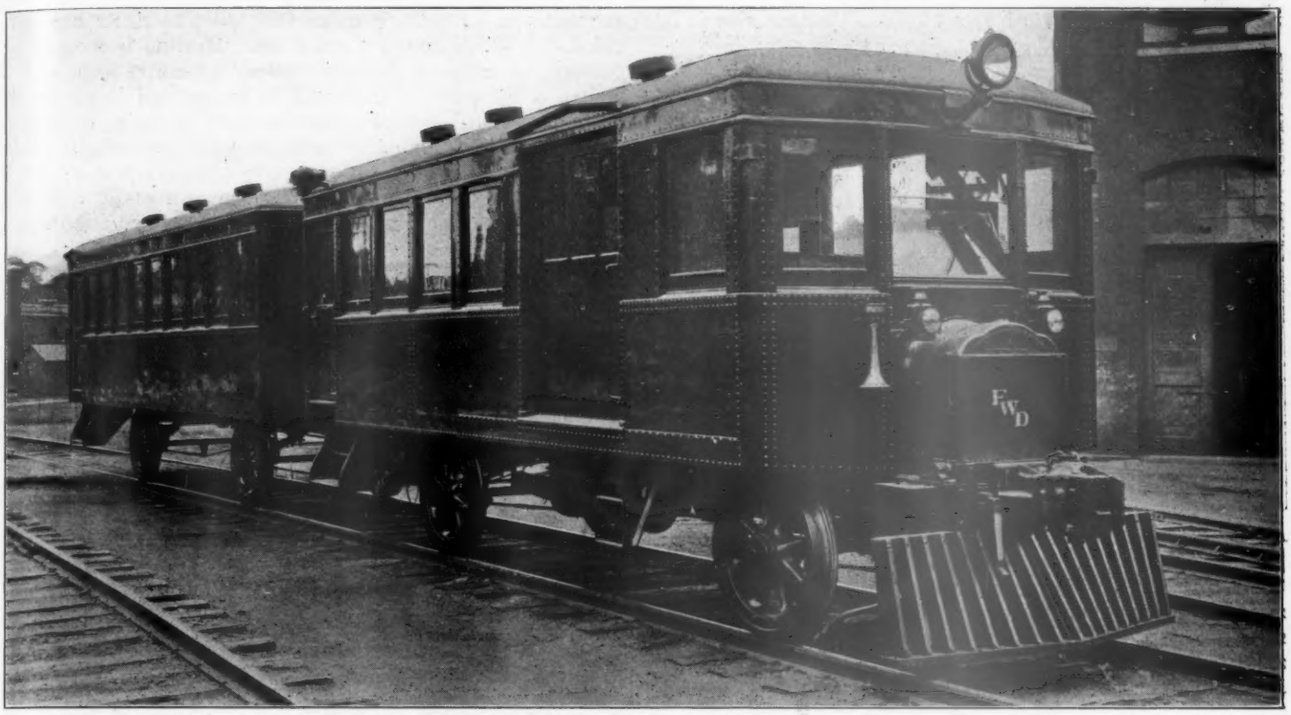
bracket is fastened to the 5½ in. wide frame by two bolts and the lever is placed at an angle of 45 deg. with the frame, thereby obtaining sufficient clearance for the spring and locating the spring adjusting screw in an accessible position.

Fig. 3 shows a novel method employed to obtain the necessary rail clearance. In this case the adjusting spring is placed horizontally just beneath the frame and a bell crank lever used to transmit the spring pressure to the wedge.

Four-Wheel Drive Motor Car and Trailer

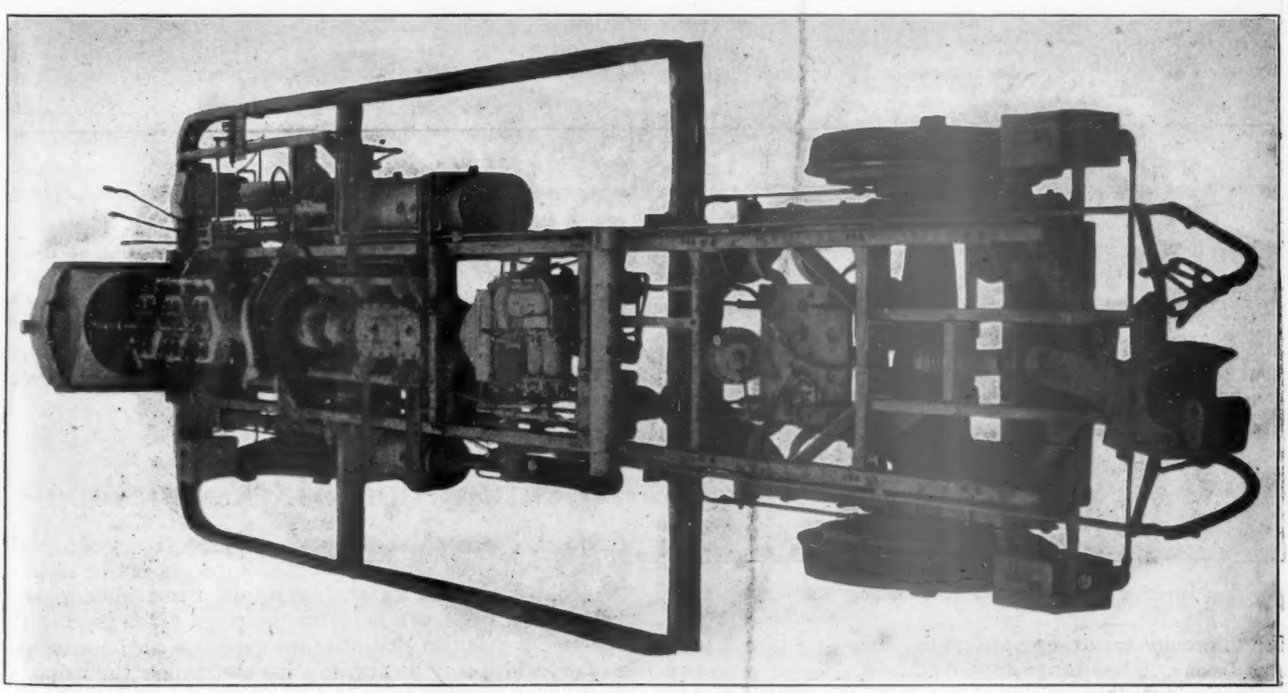
THE PAST YEAR has seen a slow but steady increase in the number of gasoline driven motor cars used on small roads and for branch line traffic on larger roads. At the present time there is a noticeable tendency toward the development of larger and more powerful units and in many cases increased flexibility is attained by the use of a trailer, a sufficiently powerful engine to drive the two cars being used for the motor car.

The Four-Wheel Drive Auto Company, Clintonville, Wis., has furnished recently to the Hoosac Tunnel & Wilmington a two-unit train in which a number of improvements have been embodied. The cars are of steel construction throughout and neat in appearance. The motor car is 25 ft. 5½ in. long from center to center of couplings and has a wheel base of 15 ft. 5 in. The trailer car is 27 ft. 5 in. long from center to center of couplings and has the same wheel base as the motor car. The body of the motor car is 21 ft. 7 in. long and that of the trailer 25 ft. 6½ in. The motor car has seats for 15 passengers and an 80 sq. ft. space for carrying 2,000 lb. of baggage or express matter. The motor car complete with body weighs 18,000 lb. or 11,000 lb. for the chassis without body. The trailer car weighs 16,000 lb. complete with body or 6,300 lb. for the chassis alone and seats 40 passengers. The great importance of a minimum light weight of car per passenger carried evidently has been kept in mind for the car weight is only 617 lb. per passenger seated.



Two-Unit Train on Hoosac Tunnel & Wilmington Accommodates 44 Passengers and Baggage

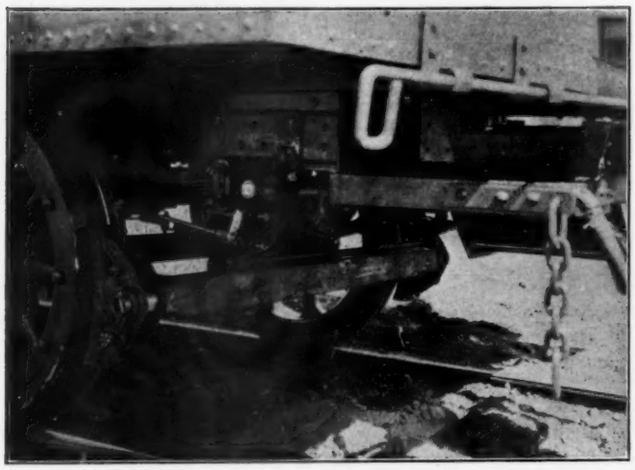
Power is furnished by a 6-cylinder Wisconsin engine having cylinders 5.1 in. in diameter and 5.5 in. stroke. The



Chassis of Four-Wheel Drive Motor Car

horsepower is 62 hp. S. A. E. rating and 94 hp. developed on brake test. The equipment includes a Stromberg plain-tube carburetor, an Eismann high tension magneto and a 30 gal. gasoline tank. Gasoline is fed by pressure, the air pressure being supplied by a reducing valve connected to the air brake system.

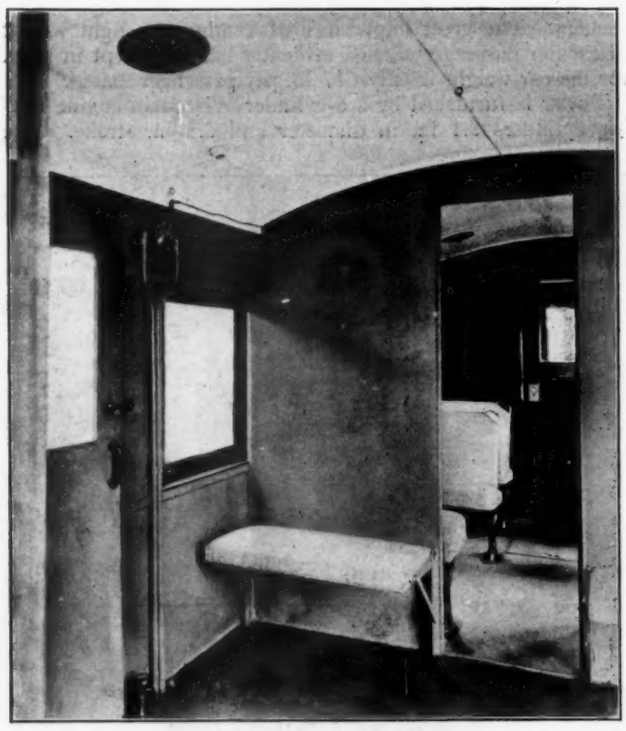
The car is driven by all four wheels. Transmission is by



Air Brakes with Well Designed Brake Rigging Are Used on These Cars

means of a jaw clutch, the gears being always in mesh. Four speeds forward and four speeds in reverse are provided. The axles are rigid and of the full floating type. The wheels are 35 in. in diameter, of cast steel and fitted with rolled steel tires.

Considerable attention has been given to the spring suspen-



Interior of Baggage and Smoking Section

sion to provide easy riding and at the same time take care of lateral sway. The springs are 54 in. long, 2½ in. wide and made of chrome-silicon-manganese steel, heat treated. The four springs are connected to the chassis frame with double spring shackles which permit the chassis to swing sidewise slightly, thus cushioning the side impacts against the rail. The spring arrangement may be seen in the illustration of the chassis and also in the view of the brake rigging underneath the car.

In equipment and furnishings the two cars are complete and modern. Drinking water and toilet facilities are provided. A. R. A. couplers are fitted. Heating is secured by passing the exhaust gases through a system of piping, although a hot water system may be substituted if preferred. Seats are of full size, the same as used in steam passenger coaches. Electric lights are used for illumination and headlight.

Air brakes of the Westinghouse semi-automatic type are provided. The air compressor of 10 cu. ft. per minute ca-

Interior of Trailer Coach of Pullman Two-Unit Train

pacity is mechanically driven from the rear of the transmission and is controlled by an automatic governor. The semi-automatic brake is a two-pipe system similar to that used on electric surface cars where motor and trailer cars are operated. Operator's valve, application valves, emergency valves, etc., are included. Cast iron brake shoes, one per wheel, are of the same type used in steam service. The manner in which the brake rigging is suspended is clearly shown in one of the illustrations.

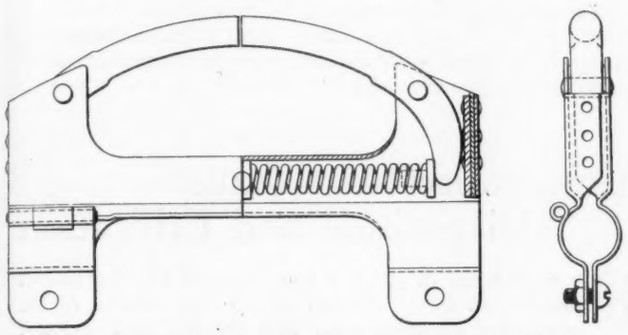
Identification Marks on Pipe

IT IS AN OLD established custom for manufacturers to roll their names on pipe so that their products can be identified. As far as we are aware, the name hitherto has always been rolled parallel with the pipe. This practice is open to the objection that after the pipe has been assembled in place, which may be next to some obstruction, the name is liable to be on the side which can not be seen. To overcome this difficulty, the Reading Iron Company, Reading,

Pa., has recently changed its practice and now rolls the name diagonally on the skelp so that at least part of the name will be in sight on practically every side of the pipe. At present this practice is being followed on all its buttweld pipe from ⅛ in. to 1½ in. inclusive; it will shortly be adopted for lap-weld sizes from 1¼ in. to 20 in. inclusive.

Vestibule Curtain Attachment

AMONG the new devices recently brought out by the Curtain Supply Company, Elkhart, Ind., is the Rex improved release handle for vestibule curtains. As will be noticed from the illustration, this handle is made in two parts, each half being controlled by a separate spring which in-



Rex Improved Release Handle for Vestibule Curtains

sures uniform spring pressure. This handle eliminates the necessity of webbing or chain attachments, is interchangeable with the plain handles now commonly employed, and automatically will return to the closed position after it has been released.

Another new device, not illustrated, is the Rex improved opening shield for vestibule curtains. This shield may be opened with one hand and no adjustment of any kind is required to close it. This is accomplished by a simple and effective spring lock.

High-Test Vanadium Steel Locomotive Frames

THE FOUR NEW Norfolk & Western electric locomotives which are being built by the American Locomotive Company and the Westinghouse Electric & Manufacturing Company, will have frames of a special high-test vanadium steel supplied by the Union Steel Casting Company, Pittsburgh, Pa. As each of these locomotives consists of two units, a total of sixteen frames will be required, four for each of the four locomotives.

The frames are quite exceptional in that they are unusually long, heavy and of peculiar design. As will be noted from the photograph, there are six pedestal openings. Four of these are of the type usually employed in steam locomotives. In addition, there are two end pedestals for the jackshafts which are of special design and heavily reinforced. These frames are 41 ft. 2 in. long with the main section 6 in. wide and weigh 23,700 lb. each.

In addition to being of unusual design and size and presenting a most difficult foundry problem, they are being cast of high-test vanadium steel. The composition used is the result of research work during the past year, this work being carried on by co-operation between the Union Steel Casting Company and the Vanadium Corporation of America. It is interesting to note, in this connection, that while the first heat of high-test vanadium steel locomotive frames was cast in the works of the Union Steel Casting Company, the first standard vanadium steel frames also were made by the same company in 1907.

The minimum tensile strength and also the yield point of this new high-test steel is 10,000 lb. greater than for the standard vanadium steel. This increase in strength has been obtained, moreover, without sacrificing anything in the way of ductility or toughness, the specification for reduction in area having been raised from 35 per cent to 40 per cent while the elongation in 2 in. has been kept at 20 per cent. A comparison between the physical properties of the two steels is shown in Table I.

TABLE I—SPECIFIED PHYSICAL PROPERTIES

	Standard Vanadium	High-Test Vanadium
Tensile strength, lb. per sq. in.....	70,000	80,000
Yield point, lb. per sq. in.....	40,000	50,000
Elongation in 2 in.....	20 per cent	20 per cent
Reduction in area.....	35 per cent	40 per cent

The manner in which the physical specifications are being met is shown by the results of eleven tests made on the five heats for the first five frames cast. Instead of giving these tests in detail, the results have been summarized in Table II. The maximum and minimum figures show the ranges for each characteristic.

Union Special High-Test Vanadium Cast Steel Frame for Norfolk & Western Electric Locomotive

TABLE II—SUMMARY OF TEST RESULTS

	Yield Point lb. per sq. in.	Tensile Strength lb per sq. in.	Elongation in 2 In. per cent.	Reduction in Area per cent.
Maximum	57,580	97,120	28.0	54.1
Minimum	48,680	80,880	22.5	39.2
Average	54,550	88,480	24.7	46.6

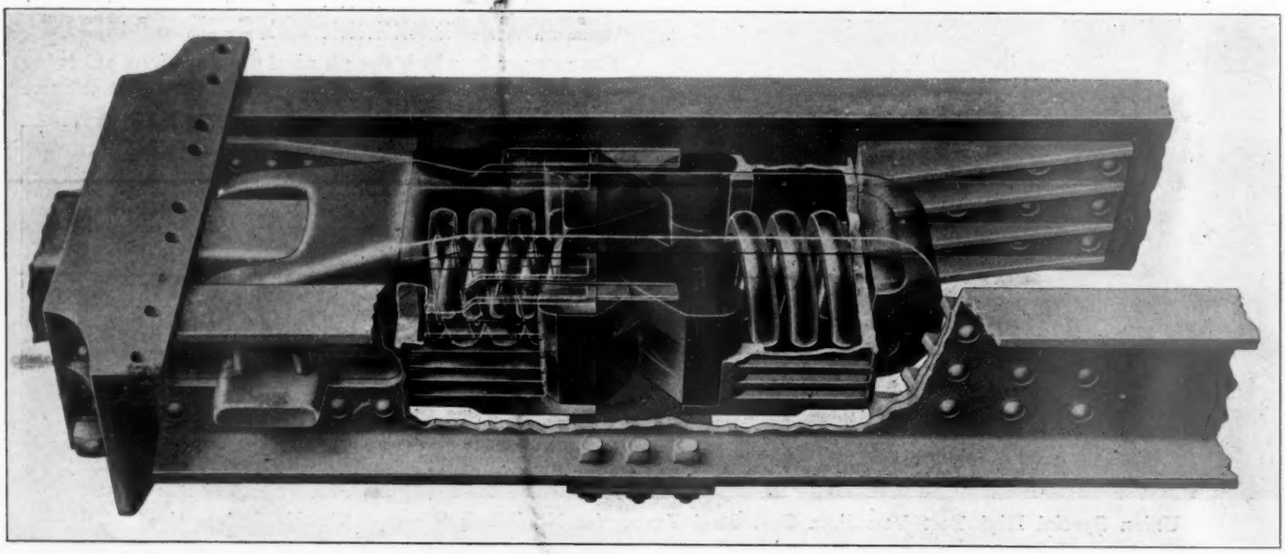
The Union Steel Casting Company, in conjunction with the Vanadium Corporation of America, has prepared a set of specifications for high-test vanadium cast steel for locomotive frames. In general form the specification agrees with those of the American Society for Testing Materials and the

American Railway Association. In addition to the physical properties already mentioned, the chemical requirements are: Phosphorus or sulphur not over 0.05 per cent, and vanadium not less than 0.16 per cent. The steel is to be made by the open-hearth, or by the electric furnace process. The castings after being allowed to cool are to be heated to the proper temperature to refine the grain. The size of the annealing lugs, the location of the test coupons, the taking of drillings for analysis and the method of conducting the physical tests are all covered. Provisions are made for re-annealing in the event of the first tests failing to meet the specifications. Minor defects which do not impair the strength of the castings may be welded with the approval of the inspector. If this is done, the castings are to be annealed after the welding has been completed.

Bradford Rocker Type Draft Gear

THE BRADFORD DRAFT GEAR COMPANY, New York, without departing from the principle or general design of the rocker type draft gear, has materially increased its strength and shock-absorbing capacity. In its present form this gear has a capacity of 500,000 lb. and can be designed for a travel up to 2¾ in.

The Bradford rocker type draft gear, as will be noted from the illustration, consists of two cast-steel spring housings, two pairs of interacting steel rockers, two sets of special springs and two spring plates between the springs and the rockers. All parts are held together for shipment and application by 1 in. by ⅛ in. band iron hooks.



High Capacity Bradford Rocker Type Draft Gear

One end of each rocker rotates on a cylindrical seat in the spring housing while the other end bears on the spring plate. The inner contacting faces of the rockers are of two different contours, the face of one rocker being straight and that of the engaging rocker being made up of a series of curves.

The peculiar shape of the rockers is such that for the first 1⅜ in. of gear travel the action of the rockers is almost entirely a rolling one. The performance is practically the same as that of a plain spring gear. As the shocks received in ordinary service would not compress the gear beyond this point, there is but little wear under normal operating conditions. The fact that the gear is assembled under initial compression insures that whatever wear may occur will have little effect on the capacity. Should the parts wear an amount equal to ¼ in. coupler travel, this would merely reduce the initial resistance of the gear from 12,000 lb. to 8,000 lb.

During the last half of the travel, the contour of the rockers increases the effective spring pressure and the friction builds up rapidly so that an ultimate capacity of 500,000 lb. is obtained. The injurious effect of unusually severe shocks occasionally encountered in service is thus guarded against.

The initial leverage ratio of the gear is about 1-⅜ to 1 and this is but slightly increased at 1-⅜ in. travel. At full travel it becomes over 3 to 1.

An important feature of the improved gear lies in the 50,000 lb. capacity springs now employed. These springs, in addition to being made of special steel and carefully heat treated, are of a peculiar section as will be noted from the illustration. The flat faces are of great value in preventing injury to the springs should the gear be compressed solid under unusually severe shock.

Air Compressor Exhaust Disposition and Utilization

FOR A NUMBER of years it has been the usual standard practice on most railroads to pipe the exhaust of the locomotive air compressor into the left back exhaust passage of the locomotive cylinder. This has been a convenient point for a connection and the air compressor exhaust was disposed of with little added draft on the fire. The arrangement is not ideal since the back pressure on the air compressor may be considerable should an air compressor exhaust occur at the same instant as that from the back end of the left-hand locomotive cylinder. To overcome this objection and at the same time so dispose of the air compressor exhaust that some real benefit will be derived from it, the Locomotive Lubricator Company, Chicago, has devised an arrangement by which the air compressor exhaust is piped to all four exhaust passages from the main locomotive cylinders. The air compressor exhaust can then, so to speak, take the course of least resistance with a corresponding benefit to the compressor in reduction of back pressure and an increase of capacity and efficiency.

The advantages of this arrangement are not limited to the air compressor as it provides an excellent drifting device. The air compressor exhaust acts to break the cylinder vacuum formed when the throttle is shut off and the locomotive is drifting down a hill or approaching a station stop and thus avoids the drawing in of front end gases and cinders through the exhaust nozzle.

When a locomotive is drifting is the time when the air compressor is frequently running at more than its average speed. Should the amount of exhaust steam from the air compressor be insufficient, as might occur on roads where there is considerable drifting, the Locomotive Lubricator Company has arranged to provide an auxiliary valve which will automatically admit a certain quantity of live steam to the exhaust passages when the locomotive throttle is closed. This valve is opened by a tappet attached to the throttle lever, but the amount of opening can be easily regulated by the engineer.

As the air compressor exhaust carries with it a certain amount of lubricating oil, the benefit to the valves and cylinders will be even greater than from direct steam. The arrangement is simple and there is practically nothing to get out of order. It is stated that the mileage of valve and cylinder packings has been materially increased and that carbon incrustation has been reduced to a minimum on locomotives equipped with the air compressor exhaust arrangement described.

American Car Door Operating Device

THE CAR DOOR fixtures made by the American Car Door Company, Michigan City, Ind., are used in connection with sliding doors for box cars and consist of the complete door hardware, including roller track, hangers, rollers, front lips, rear stops, bottom guides, burglar-proof guides, steel binding, American flexible protection strip and the American door operating device.

The principal feature of these fixtures is the door operating device which is a door starter, closer and sealing arrangement combined into one unit. The purpose of this device is to afford a mechanical means to force the door open or to pull it closed which will prevent the necessity of prying or sledging at the door to start it open or completely to close it.

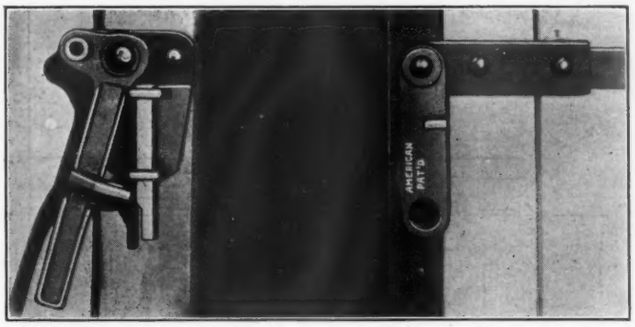


Fig. 1—American Car Door Operating Device in Disengaged Position

Power to open or close the door is obtained by the use of a bell-crank lever located on the door post and the connecting link attached to the sliding door. The door travel of 2½ in. is secured with a lever ratio of 5 to 1.

In the closed and locked position the connecting link is engaged with a protruding lug on the bell-crank lever and is in a horizontal position. A seal-pin is provided which is in front of the connecting link and is free to be raised and lowered within the limits of the two lugs in the bracket. The seal-pin is retained within these two lugs by the heads of a rivet which passes through the central portion of the seal-pin. The handle of the lever is in a vertical position and is provided with a slotted lug which the lower portion of

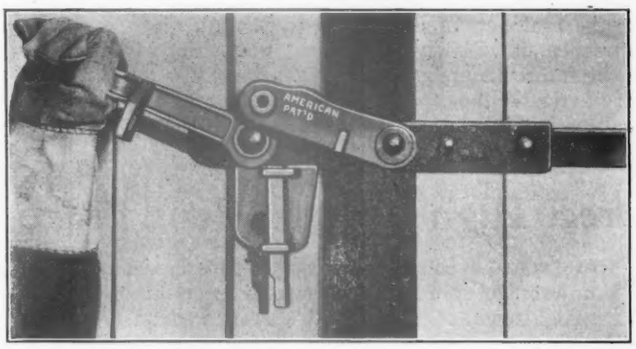


Fig. 2—A Powerful Force Is Available for Opening or Closing the Door

the seal-pin passes through, locking it in place. The upper projecting portion of the seal-pin, which is forward of the connecting link, locks it in position and it cannot be disengaged from the lug on the lever without first raising the seal-pin to disengage the lever and then dropping the seal-pin to its low position.

The seal passes through the upper portion of the seal-pin

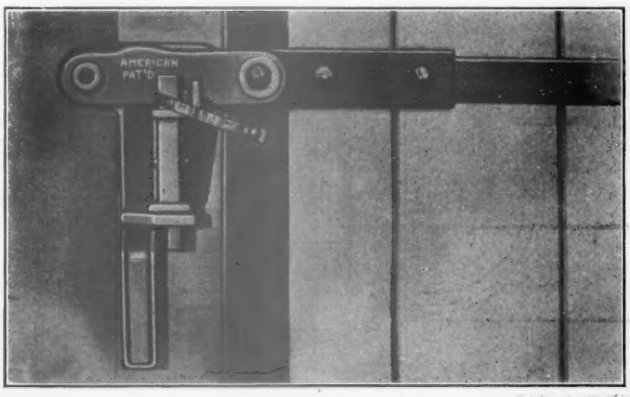


Fig. 3—Door Locked and Car Sealed

and the slotted lug on the connecting link, making it impossible to operate the device or to gain entrance to the car without destroying the seal.

When the car door is open all parts of this device are clear of the door opening and do not project or obstruct the door opening.

Life of Boiler Washing Plants Increased

THE RAPID DETERIORATION of the enginehouse piping has caused excessive maintenance costs for boiler washing plants. By using drop forged flanges, shrunk and welded to the mains, with welded flange connections, and leadizing all the mains after fabrication, the National Boiler Washing Company, Chicago, now provides relative permanency in enginehouse piping.

The development of the tandem condenser has made it

possible by adding condenser units, as they may be needed, to increase the number of locomotives that can be taken care of at one time up to the capacity of the enginehouse mains. The multiple storage tank system, whereby any number of tanks connected together can be used either for washing or filling, has made it possible by adding additional tanks to double the capacity of a washout plant at comparatively small expense, provided the original mains were made large enough for the future additions. As these mains now are reasonably permanent it will pay to start out with them as large sizes as the future may require. If this is done, it is comparatively easy to double the capacity of the plant by adding additional condenser units and additional tanks in the pump room.

Ureco High Powered Hand Brake

SOME FORM of a power multiplying mechanism, such as a leverage system or gearing, is essential on modern heavy freight cars in order to secure an adequate amount of brake shoe pressure when the hand brake is employed. The hand brake is so vital a part of the brake system and is used so frequently in switching movements and for holding cars after they have been placed in position that few roads now rely upon the direct pull of the hand brake chain wound up on the brake staff itself.

Gearing has been one of the most satisfactory methods employed for multiplying the power exerted at the hand brake wheel. Among the devices of this class is the Ureco Hi-power geared hand brake made by the Union Railway Equipment Company, Chicago. This is readily adaptable to any type of freight car with either a stationary or a drop brake shaft.

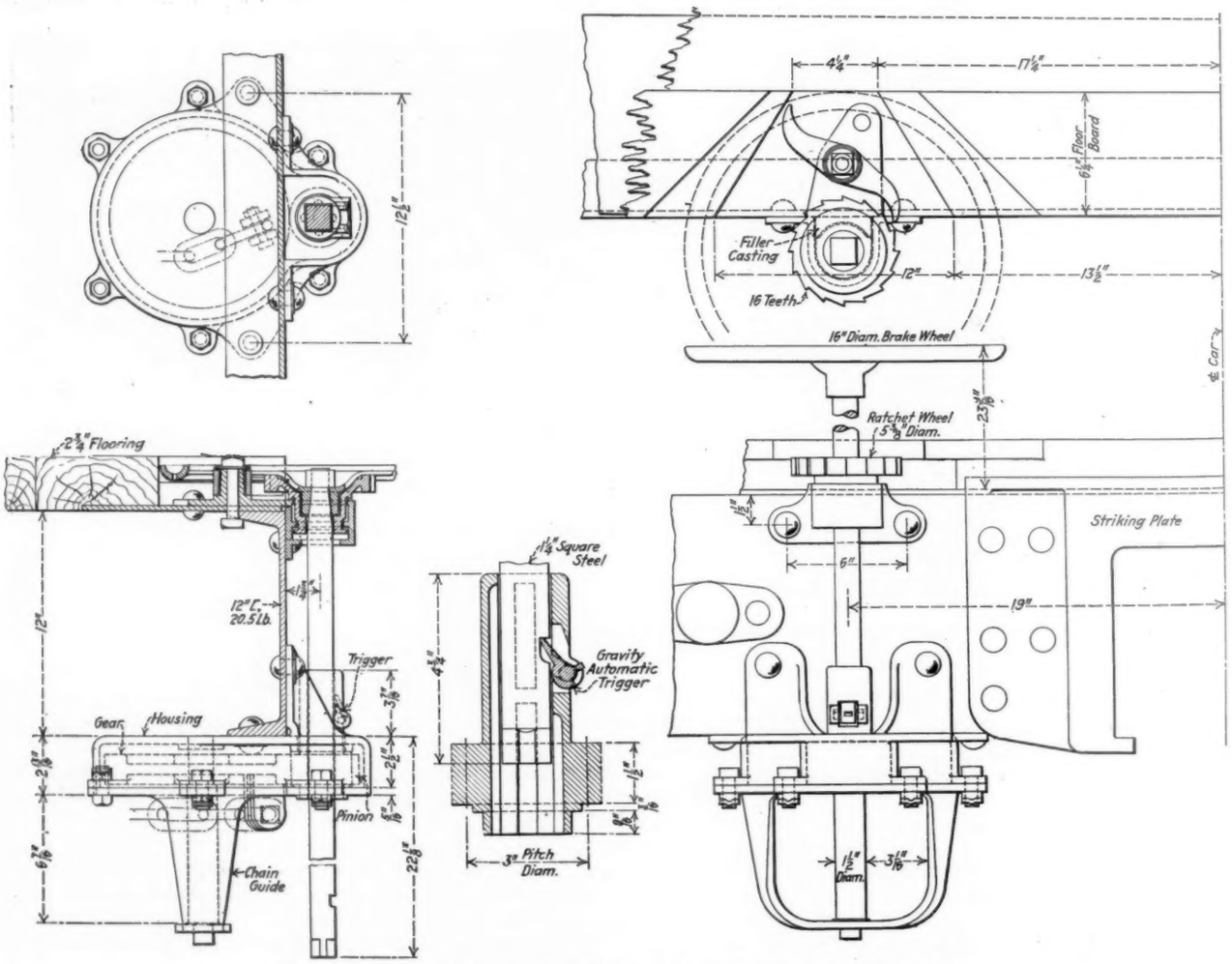
The particular arrangement shown in the illustration is one employed on flat cars where a drop brake shaft is desired in order to remove all obstructions and thus permit ready loading of long material, the hand brake wheel being dropped flush with the floor when so desired. The arrangement employed for holding the brake staff in either the extended or the dropped position is simple and reliable and permits of a quick change from one position to the other.

The gearing is so proportioned as to deliver practically the same power as a 10 in. air brake cylinder with the exertion of 200 lb. on the hand brake wheel. Another advantage of this particular design is that one set of castings is suitable for a wide range in the types of cars and thus parts are interchangeable on practically all kinds of freight cars.

Wabco Gaskets for Brake Cylinder Pressure Heads

THE WESTINGHOUSE AIR BRAKE COMPANY, Wilmerding, Pa., has developed and recently placed on the market a new brake cylinder pressure head gasket, called the "Wabco." These gaskets are made of the same materials as enter into the construction of Wabco packing cups which have been in general service for some time.

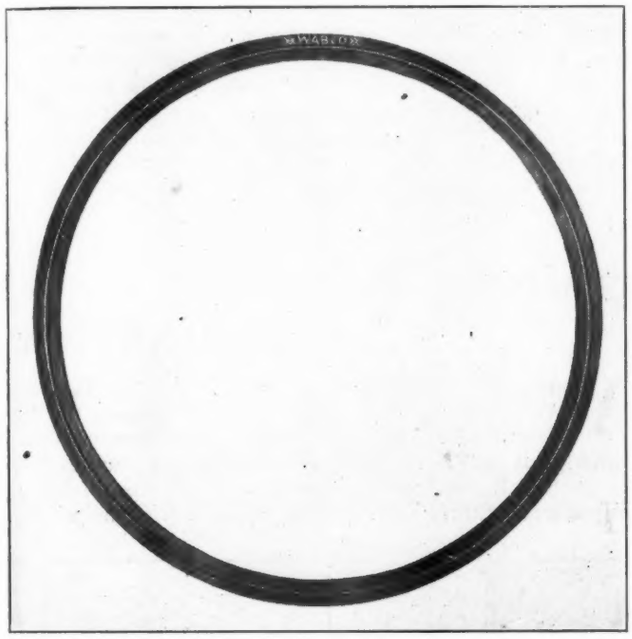
A tough, oil-proof and heat-proof composition is used in combination with an open-mesh, heavy cord fabric. The



Ureco Hi-Power Geared Hand Brake with Drop Shaft for Flat Cars

fabric, around and through which the composition is moulded, serves as a skeleton framework to give stamina to the gasket. It is not as limp as the ordinary rubber gasket and the work of applying it to the brake cylinder consequently is considerably facilitated.

The special composition employed is of such character that it will not disintegrate even after long service under conditions which would cause the ordinary rubber gasket to break down. Because of the fact that they remain intact when removed from the cylinders at the cleaning period, Wabco gaskets can be reapplied, which is rarely possible when a rubber gasket is used. These gaskets do not lose their life when subjected to high cylinder temperatures, therefore they are especially valuable for use in driver brake cylinders which often are so located that they receive considerable heat from the boiler of the locomotive.



Wabco Gasket for Brake Cylinder Heads

Three New Uncoupling Devices

THE RELIABLE RAILWAY EQUIPMENT COMPANY, Chicago, has recently developed several new attachments for uncoupling cars, among which are a pressed steel uncoupling rod bracket and two types of uncoupling rod links.

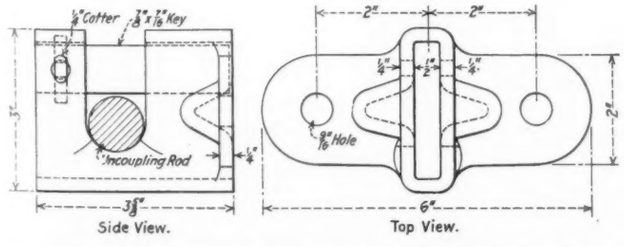


Fig. 1—The Reliable Uncoupling Rod Bracket Is Made of Pressed Steel

The bracket, known as the Reliable uncoupling rod bracket, was designed to overcome the trouble and expense in connection with the breakage of the cast brackets commonly used. It is formed from a single piece of ¼-in. steel plate, punched and pressed into shape, and is light in weight and durable. As will be noted from the illustration, Fig. 1, the uncoupling rod is held in place by a ⅞-in. by 7/16-in. retaining key which in turn is secured by a ¼-in. cotter. The uncoupling rod can be removed quickly and easily by simply pulling out the cotter and slipping out the retaining key.

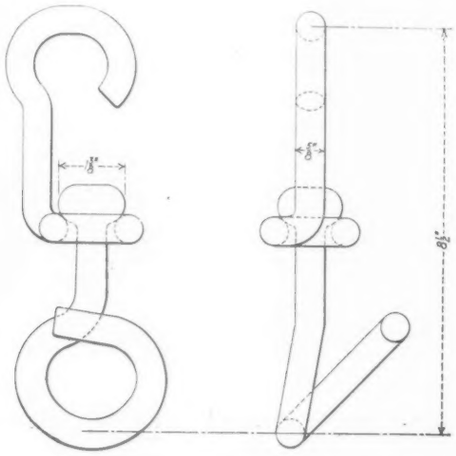


Fig. 2—Presto Uncoupling Device

The Presto uncoupling device, shown in Fig. 2, is formed of two pieces of ⅝-in. round steel. The lower loop is slipped through the eye in the lock lifter of the coupler and then bent back to close the opening. The upper loop fits the eye in the uncoupling rod lever. It is left open for application and afterwards closed.

The E-Z-Fit uncoupling device, shown in Fig. 3, also is composed of two special links. In this case the two links are alike. The ends next to the lock lifter and coupling rod lever are squared and too large to pass through the eyes. The other ends are left open and closed after they have been joined at the center.

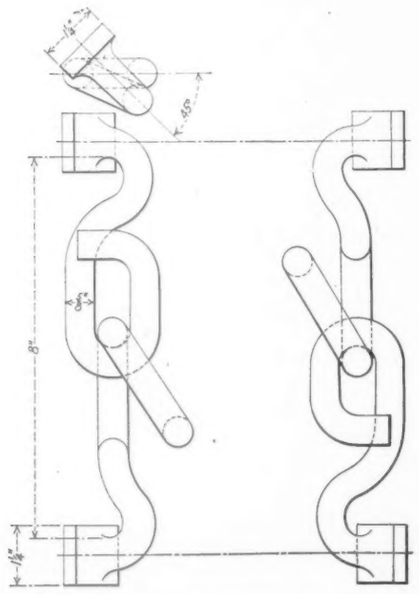
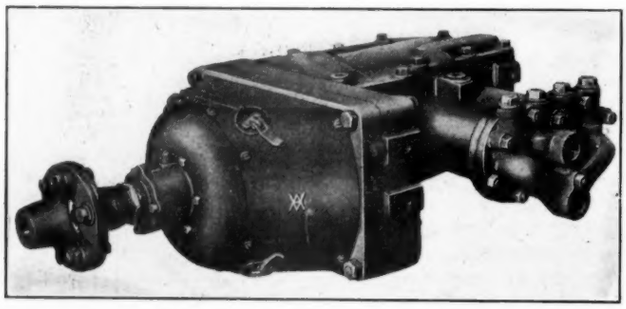


Fig. 3—E-Z-Fit Uncoupling Device

Air Brake Equipment for Gasoline-Driven Rail Cars

A NEW FORM of air brake equipment has been developed for gasoline-driven rail cars by the Westinghouse Air Brake Company, Wilmerding, Pa. Since this service involves the operation of a single motor car, or at the most a motor car and a trailer, the equipment is of the semi-automatic type.

The source of pressure for the brake system is an air compressor, mechanically driven from the power take-off on the transmission through a pneumatically operated disc clutch. The compressor is single-acting with two cylinders, and because of its low, compact design, is called the "Bungalow" type. Its operation is automatically controlled by a governor of the double safety valve type.

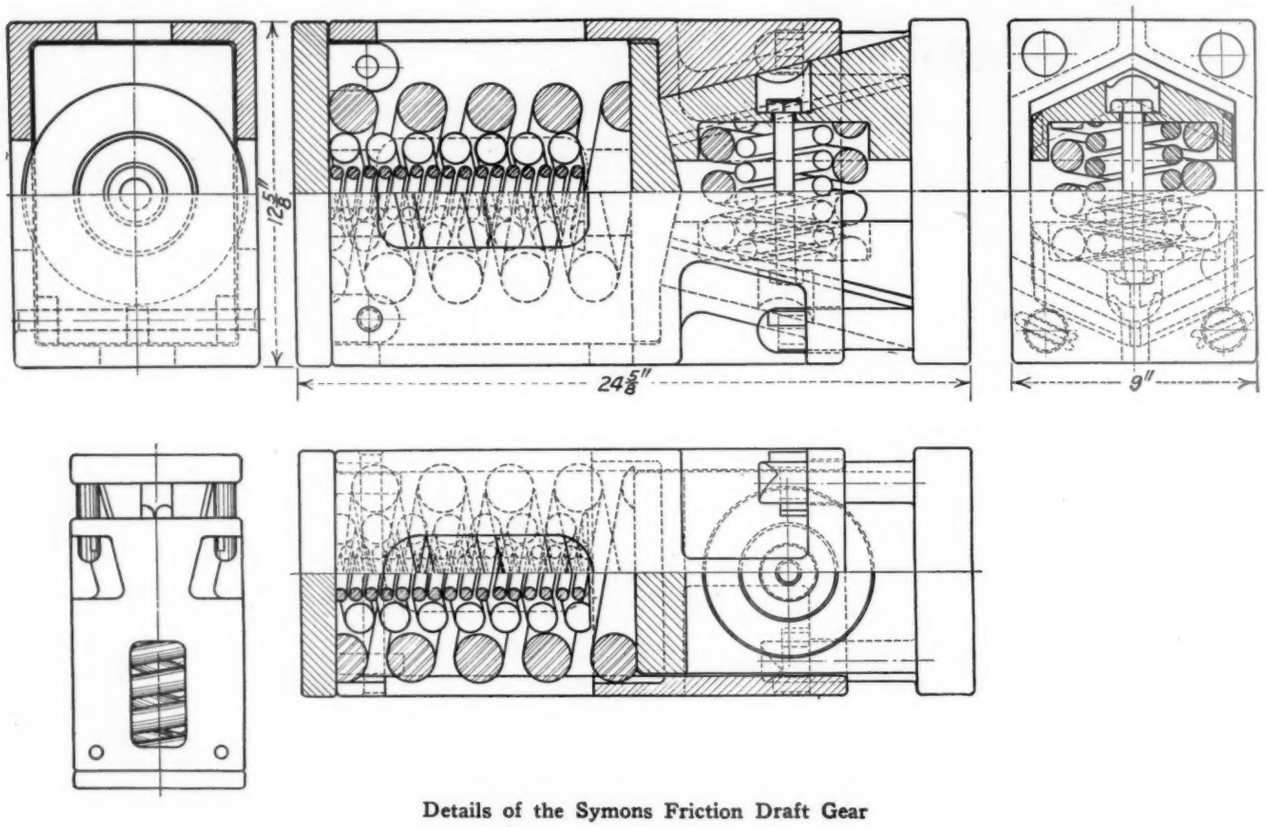


Mechanically Driven Bungalow Type Air Compressor

This semi-automatic equipment has all the advantages of a straight air brake equipment in which air is admitted straight from the reservoirs in which it is stored to the brake cylinder through the brake valve and piping during ordinary service brake applications. It is simple, of few parts and flexible; i. e., the pressure in the brake cylinder may be increased or decreased at the will of the operator in accordance with the requirements of condition of rail, grade, loading and kind of stop desired. It also has the safety features of an automatic equipment. During service operations of the brake, pressure is maintained in an emergency pipe. Should it be imperative to stop the car in the shortest possible distance to avoid accident, placing the brake valve handle in emergency position actuates the emergency valve which automatically opens a direct communication between the main reservoirs and the brake cylinder, resulting in a very prompt application. In case of ruptured piping also, the automatic feature operates. The automatic characteristic of this equipment makes it suitable for use on a motor and trailer car train in view of the safety and assurance of an application which are secured in the event of such an emergency as that of a burst hose or a break-in-two.

Symons Double-Vee Friction Draft Gear

A NEW TYPE of friction draft gear, known as the Double-Vee, is being introduced by the designer, W. E. Symons, New York. As will be noted from the illustrations, this gear is of simple construction and contains but few parts. It consists of a casing, two V-shaped friction wedges, a set of three draft springs, a pair of friction springs, a bolt for holding the friction blocks and springs together, an end casting for the casing, an inside spring seat and a follower.



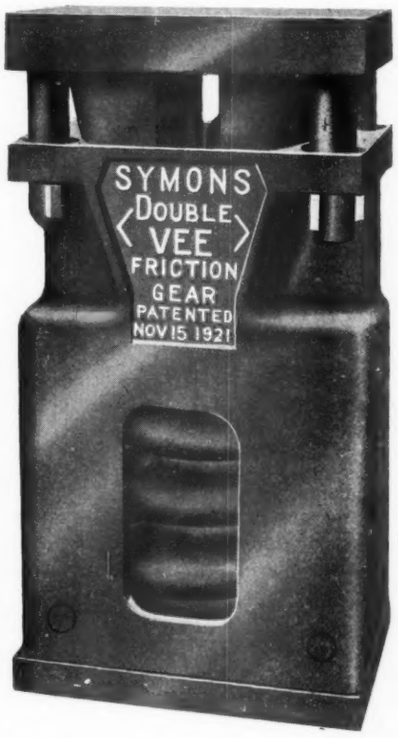
Details of the Symons Friction Draft Gear

The name of the gear is descriptive of the shape of the friction faces of the wedges and the casing grooves in which they function. The spring capacity is from 40,000 to 50,000

lb. and the gear travel 2½ in. In a test of one of these gears, the following results were obtained:

Travel	Capacity
½ in.	32,000 lb.
1 in.	56,000 lb.
1½ in.	84,000 lb.
2 in.	201,000 lb.
2½ in.	233,000 lb.
Closing	285,000 lb.

An important feature of this gear is the fact that it is a complete and self-contained unit. All parts, including the follower, are fastened together ready for application. No separate or additional parts are required.



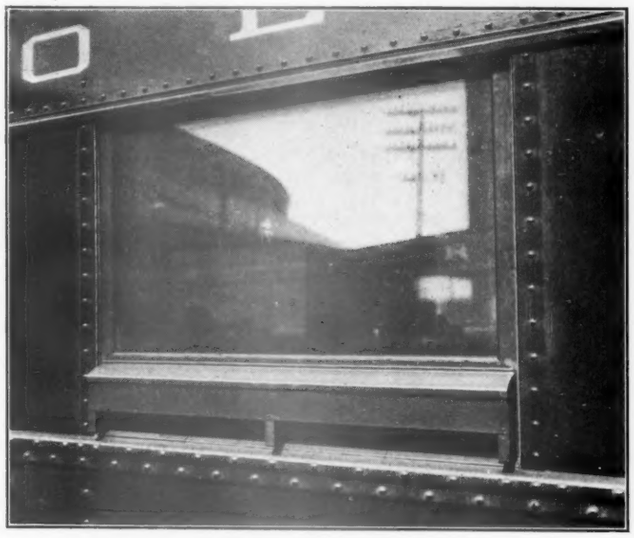
Symons Draft Gear Is a Complete Unit

As will be noted from the drawing, the dimensions are such that it can be applied in the standard A. R. A. gear pocket, 9 in. by 12⅝ in. by 24⅝ in.

Harrison Ventilator Sash

THE COMBINATION VENTILATOR COMPANY, Richmond, Va., is introducing a novel ventilator for the sash of passenger coaches which is the design of Charles L. Harrison. The primary purpose of the Harrison ventilator, which is an integral part of the sash itself, is to provide the maximum of clean, fresh air to travelers in railway passenger cars of all types, and in such a manner that the amount can be increased or reduced at the will of the individual passenger without interference with the ventilation desired by other passengers in the same car. The control is by means of a hinged shutter that can be operated without effort and without arising from the seat.

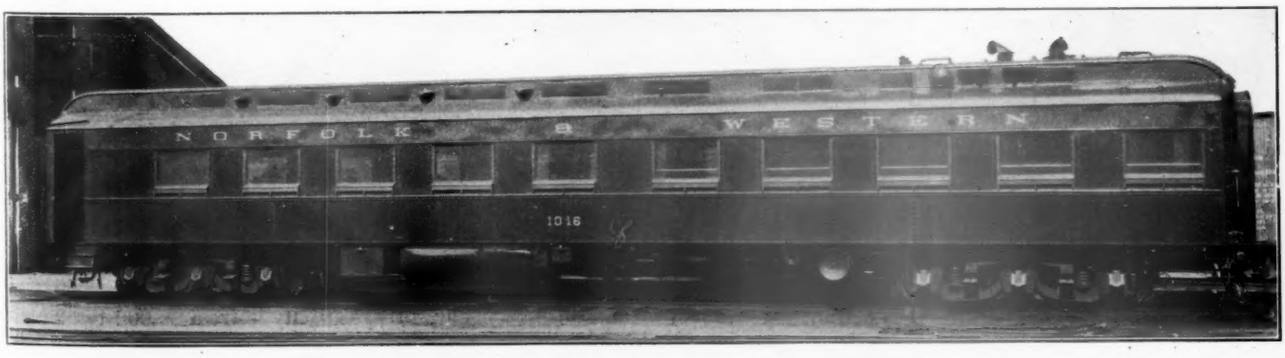
Referring to the drawing, it will be noted that the ventilator is of simple construction, compact and durable, the only moving parts being the control shutter. A slight pressure or pull applied to the knob on the shutter will adjust and lock it in any desired position.



Close-up Outside View of Sash with Harrison Ventilator

The opening of the sash is fitted with a small removable screen horizontally placed. This screen is made of brass wire, 0.015 in. in diameter, with 22 meshes per inch, and gives a free opening of 45 per cent of the area. This netting opening is 1½ in. wide and practically the full length of the sash. The screen is protected by an outside sheet metal hood and its horizontal position is such that it serves to exclude rain as well as cinders, dust, snow or other flying particles. As it is so placed that it is not exposed to the elements and as the passenger does not come in contact with it, the wear is slight and the period of service correspondingly long. Should replacement prove necessary, a renewal can be made in a few moments with no other tool than a screw driver for the removal of four small screws.

The Harrison ventilator sash requires no change in the frame construction of a car and may be installed in the same manner as the ordinary sash now in use. There being no inward projections, it is adaptable to single or double windows of any size. Where double sash is used, as in Pull-



Dining Car Equipped with Harrison Sash Ventilators

man cars, this ventilator sash does not interfere with the raising or lowering of the inner sash. The ventilator projects only 2¼ in. beyond the face of the sash which is usually inside the outer line of other projections. It occupies but little more space at the window base than the frame of the ordinary type of sash and eliminates the projecting deflector of the ordinary sash ventilator used on Pullman cars. The small deflector shown in the drawing and on the other

Interior View of Car with Harrison Sash Ventilator—Left Half Open—Right Half Closed

illustrations is employed to divide the air current and thus increase the capacity of the ventilator.

The advantages of a ventilator which will insure an adequate quantity of fresh, clean air and without the sash being raised are numerous and obvious. Among them, the following may be mentioned: The comfort of passengers is increased by the freedom from cinders and dirt. Cars are freer from dirt at the end of a run and require less frequent cleaning.

The air admitted is deflected upward and there is no draft upon passengers. The device does not become useless in stormy weather. It is not necessary to open or close windows in order to secure ventilation or when entering or leaving tunnels. It might even be possible to adopt fixed stationary windows.

The ventilator fixture takes the place of the lower rail of the sash ordinarily used and does not obscure the vision, being an integral part of the sash, there is nothing to remove for cleaning or storage purposes, consequently there is no chance of loss and the risk of damage is likewise materially reduced.

No handling or adjustment is required when the motion of the car is reversed as the ventilator sash operates equally well in whichever direction the car is moving.

Cars standing in yards may be kept fresh through continuous ventilation without the risk of the interior becoming wetted or damaged from sudden rain or wind storms.

The ventilator sash is suitable for washrooms and toilets, offering privacy and convenience and eliminating screen, deflector and roller shades.

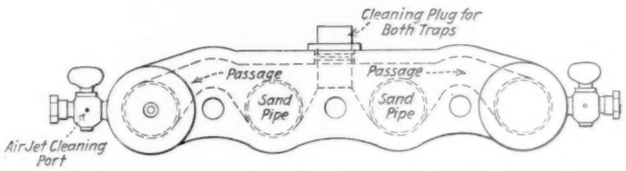
The Harrison ventilating sash has been applied to cars on several roads. Included among the cars thus equipped are a number of dining cars.

Tests that have been conducted have shown that the capacity of the ventilators, all being open, and the car running at a speed of at least 25 miles an hour, is sufficient to effect a complete change of the air contained in the coach in from one to two minutes and that the freedom from dirt and cinders is noticeable.

While designed for use on passenger coaches, the Harrison ventilator sash would be equally effective and advantageous in postal, express or electric cars. They furthermore could be adapted readily for use in windows of offices, hotels or other buildings.

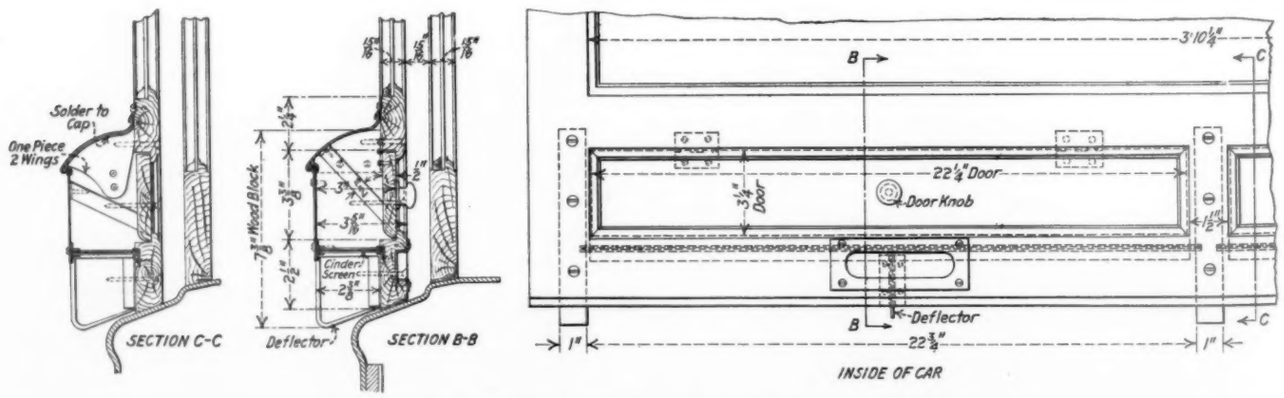
Watters Double Sander Trap

THE NO. 11 DOUBLE SANDER TRAP designed by J. H. Watters, Anniston, Ala., is simple, can be cleaned easily should any obstruction occur and is interchangeable with other types of double sander traps. A single central



The Watters Double Sander Trap Is Arranged for Quick Cleaning of Air Jets and Traps

cleaning plug when removed, permits of the cleaning of either or both portions of the trap. The air jets are located outside of the sander body. The shut-off cocks are counterbored larger at the end entering the sander, thus permitting the air to expand and eliminating the cutting action of the sand blast against the body of the trap. A hole is drilled crosswise through the body of the cock to register with the opening in the plug when it is turned to the closed position. When

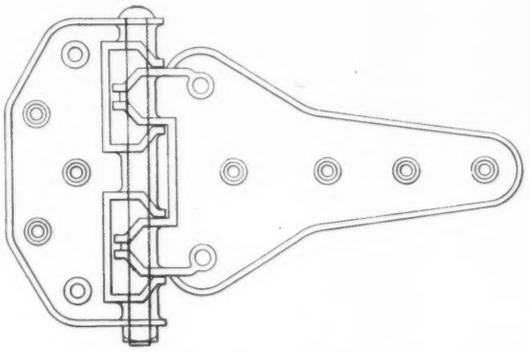


Construction of Harrison Sash Ventilators as Applied to Dining or Pullman Cars

turned to this position, a small wire can be passed through the cock which will clean out any obstruction that there may be at this point.

Self-Locking Door Hinge for Refrigerator Cars

AN IMPROVED PATTERN of a refrigerator car door hinge that will automatically lock the door in open position when it is swung back is being introduced by the Union Railway Equipment Company, Chicago. When the door is thrown back the lugs drop down into the recesses and securely hold the door in an open position. A slight pull on the outer edge of the door is sufficient to permit of its closure. The



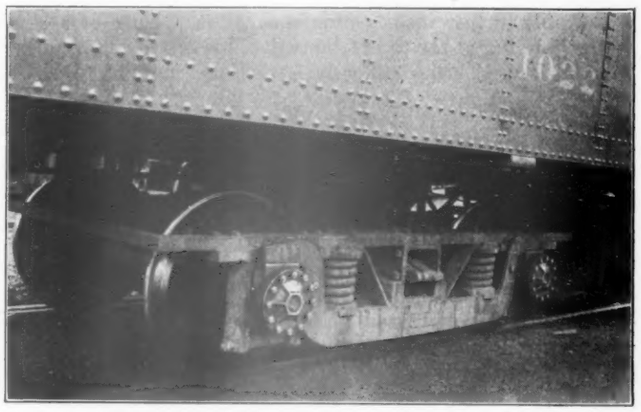
Refrigerator Car Door Hinge Which Holds the Door in Open Position

locking arrangement eliminates the use of hook and eye for holding the door in open position and is sufficient to prevent the door swinging back and forth while the car is being loaded or unloaded.

Applications of Stafford Roller Bearings

SINCE THE FIRST freight car truck was equipped with Stafford roller bearings on the Michigan Central in 1920, the Stafford Roller Bearing Car Truck Corporation, Lawton, Mich., has made a number of improvements in the details of design. A later application on a baggage car equipped with six-wheel trucks of the pedestal type was fully described in the *Railway Age,* March 31, 1923.

A still more recent application has been made to the trucks of a heavy interurban electric car on the San Francisco-Sacramento railroad, which is in operation between Oakland and Sacramento, Cal., a distance of approximately 90 miles.



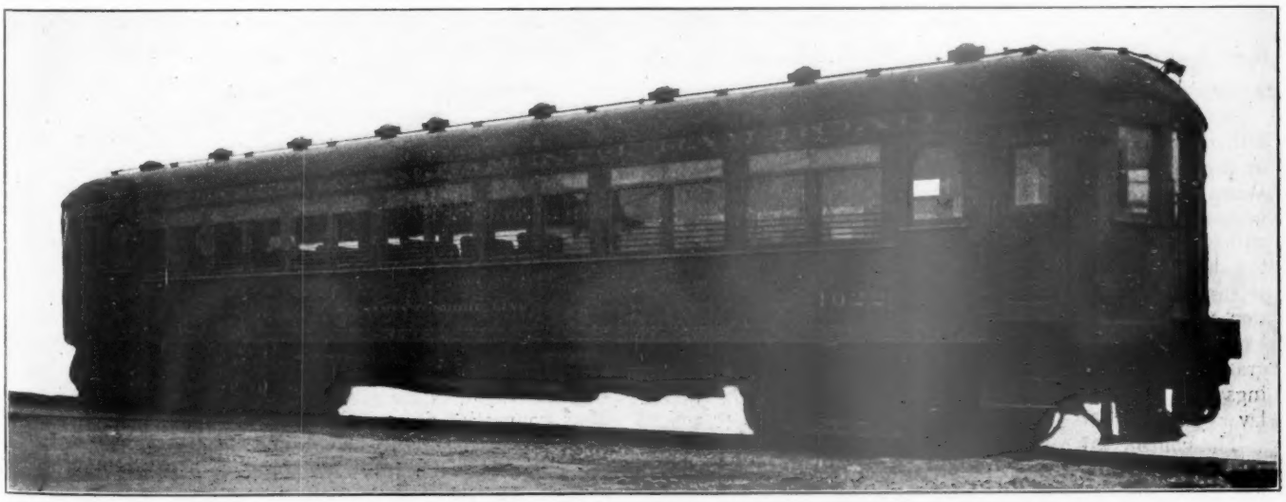
Stafford Roller Bearings on Baldwin Truck

The four-wheel trucks under this car were designed and built by the Baldwin Locomotive Works and are of an entirely different type from either of those on the Michigan Central. A glance at the illustration, however, will show that the application was made without difficulty. The design and limited space required for these bearings makes their application practical on trucks of practically any type or design.

Clark Pressure Retaining Valves

THE CLARK COMPANY, West Pittston, Pa., has now designed complete pressure retaining valves of both the single and the double pressure types. These contain the Clark valve of rubber composition which was designed originally as a substitute for the weighted valve in the older type of retainers.

The plug cock used in other pressure retaining valves has been dispensed with and in its place a camshaft has been mounted in the top of the case. This cam, dependent upon its position as determined by an attached lever handle, either permits the valve to lift and allow the exhaust from the



Interurban Electric Car on San Francisco-Sacramento Railroad Equipped with Stafford Roller Bearings

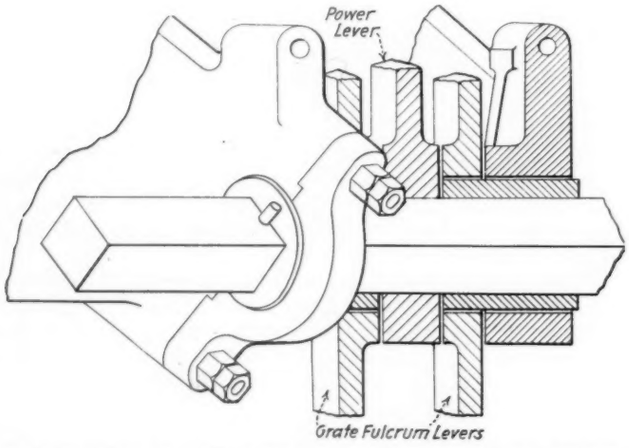
triple valve to escape to the atmosphere without obstruction or exerts a certain pressure on top of the stem attached to the rubber valve and thus determines the amount of air pressure retained in the brake cylinder. In the single pressure retainer there are two positions for the cam shaft handle and three positions for the double pressure retainer. The possibility of leakage past a plug cock is obviated by this construction.

A still further modification consists in the use of a single attaching lug at the top of the valve. With this form, a pipe clamp is used below the valve.

Franklin Power Grate Shaker Improvements

THE FRANKLIN RAILWAY SUPPLY COMPANY, New York, has incorporated several changes in the design of the power grate shaker and in the method of connecting it to the grate rigging which has increased the reliability of action, added to the durability and reduced the expense of maintenance.

A full throw of the grates is essential and in order that this may be insured, the number of connections between the grate shaker and the grate rigging should be as few as possible and the pins properly fitted. The best arrangement is secured by fastening the grate shaker cylinders to the back head of the boiler, connecting the two cylinders together with a square shaft and rigidly attaching the power arms to the shaft instead of fitting them loosely as has been the practice



Split Bearings Are Used When the Power Arms Are Rigidly Attached to the Shaft

hitherto. In some instances the power arms now are shrunk on the shaft and in other cases they are attached by welding. When the power arms are rigidly fastened to the shaft, it is necessary that the grate lever fulcrum brackets be equipped with split bushings so that the caps are removable to permit the shaft to be taken out. With this new arrangement, which is shown in the illustration, the only points where lost motion may develop are in the connections to the connecting locks and the pins in the ends of the fulcrum levers and the grate bars. The two inside grate fulcrum levers and bushings are of course applied to the shaft before the power levers are attached.

The control valve has been changed from the poppet type to the slide valve type. This change was made because it has been found that after continued service the poppet valve would wear and permit live steam to blow past the valve into the exhaust port and maintain a back pressure on one end of the cylinder which considerably reduced the power of the shaker. With the slide valve now used, this cannot occur as a free exhaust is maintained at all times. A slide valve is, moreover, much more easily maintained than a poppet valve as it can be reseated easily should a leak occur. With the poppet type valves, when wear developed, it was necessary to bush the valve body and apply a new standard valve in order to secure a proper fit.

National Graphite Locomotive Lubricator

THE TYPE B NATIONAL graphite locomotive lubricator, shown in the illustrations, is made by the National Graphite Lubricator Company, Scranton, Pa., and is designed for application to piston valve locomotives. It consists of a body casting screwed into the steam cavity of the locomotive valve chest, a magazine tube, a suitable cap, and

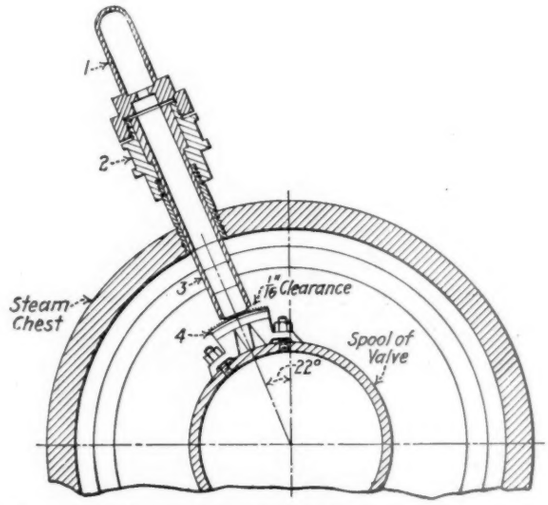


Fig. 1—Application of Type B National Graphite Lubricator to Piston Valve Locomotive

an abrasive member attached to the valve spool. Graphite in stick form is inserted in the magazine and as it rests against the abrasive member is worn off by the reciprocating movement of the valve.

For attaching the lubricator, the valve chamber is drilled and tapped for the 1¼ in. pipe thread on the lubricator body.

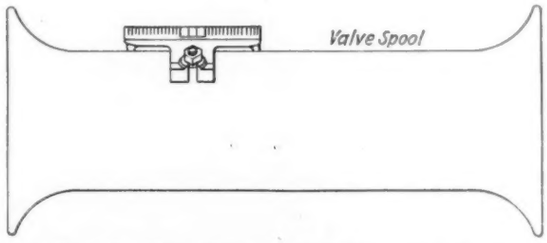


Fig. 2—The Abrasive Member Is Fitted and Bolted to the Valve Spool

This connection is usually made on the center line of the chest provided a relief valve is not located at this point; in the latter case the lubricator is located 5 in. back of the center. In order to clear the steam pipe, the lubricator is commonly placed at an angle of about 22½ deg. from the

vertical, but may be inclined as much as 45 deg. if necessary. Care should, of course, be taken to drill the hole radial to the center line of the valve chest. The abrasive member is fitted and bolted to the spool of the valve as shown in Fig. 2. In applying the magazine tubes they should be adjusted to give 1/16 in. clearance between the end of the tube and the abrasive member. While the amount of graphite required depends somewhat on the type of locomotive and upon the class of service, experience has shown that about one inch is ordinarily sufficient for a run of from 75 to 100 miles.

Gold Packless Car Heating Specialties

IN LINE with the established purpose of the Gold Car Heating & Lighting Company, New York, eventually to eliminate all packing from its equipment so as to minimize maintenance expense, it has added this feature to its No. 1112 inside vapor valve, which will be hereafter known as No. X1112.

It will be noticed by referring to Fig. 1, that this is accomplished in this valve by the use of a flexible bellows which expands and contracts with the valve stem movement. As

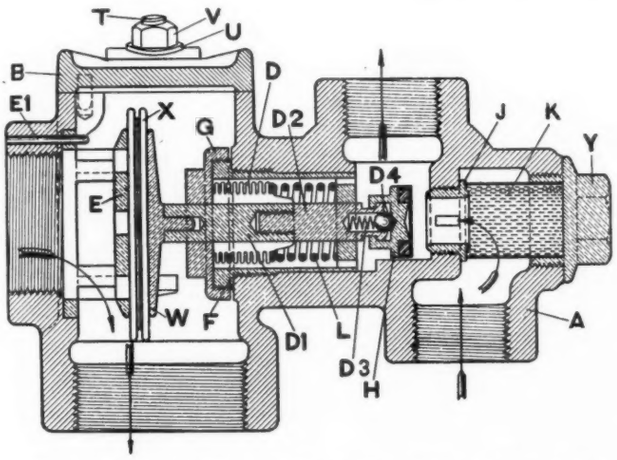


Fig. 1—Sectional View of Gold No. X1112 Vapor Valve

the travel of this stem in functioning is approximately 3/16 in., the actual movement of each corrugation of the flexible bellows is very slight; therefore, the wear is practically nil. The valve stem is made in two sections, D-1 being the diaphragm end and D-2 the disc end. These two sections

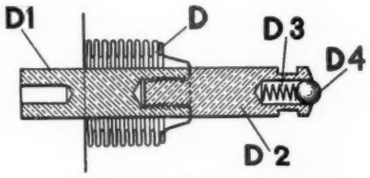


Fig. 2—Valve Stem Assembly

are screwed together, supporting the flexible bellows at its closed end. This connection is positively sealed to prevent leakage of steam and also to prevent loosening of the joint. The portion of the bellows on which the spring seats is reinforced to prevent wear at this point.

The combination of parts D, D1, D2, D3 and D4 are fabricated as a unit and may be removed, if necessary, intact, and replaced without dismounting the valve.

The outstanding special features claimed for this valve are the following: The valve diaphragm is permanently set, eliminating the adjusting screw. The position of the valve inside of car (see Figs. 3 and 4) is not exposed to cold outside temperatures. Ventilation by the rustless drip horn No. 939 with a division extending the entire length and protruding slightly beyond the bottom opening has several advantages. As the position of the division is crossways of the track, a positive air draft is forced up the forward opening to the diaphragm chamber. A suction effect

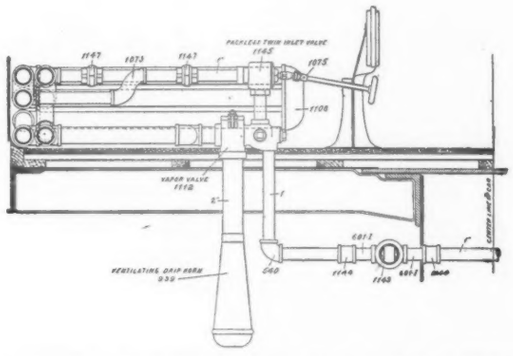


Fig. 3—Application Showing Rustless Ventilating Drip Horn No. 939

also is caused in the rear chamber, thus creating a continual forced ventilation of the diaphragm chamber. This forced ventilation has the effect of making the valve more sensitive to outside temperature changes, allowing steam to be admitted to the radiators at more frequent intervals; therefore, the radiator temperature is kept approximately between 210 and 212 deg. F. There is no loss of steam.

The valve employs no bell cranks or levers, simply a straight push from diaphragm, thus reducing wearing parts

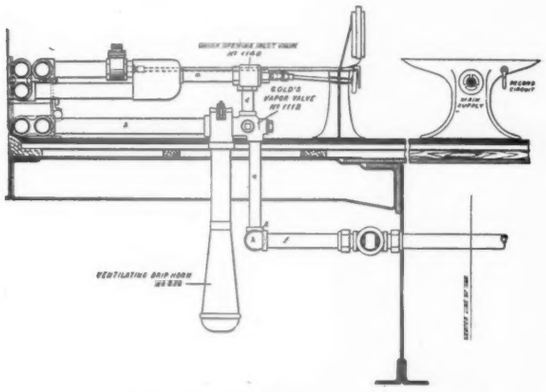


Fig. 4—Application to Existing Piping Showing Second Circuit Control Left Intact

to a minimum. The valve seat is of composition, insuring a tight valve when closed; this seat is easily renewable by removal of the plug from the side of the valve. The valve is compact and aside from being inside of the car, the diaphragm chamber is close to the live steam admission point, consequently the danger of freezing is eliminated. The valve is light in weight and less piping is necessary for its installation.

With the advent of the packless feature in the Gold No. X1112 vapor valve, that company is now prepared to furnish a complete packless vapor car heating system; i.e., the twin supply valve, the end train pipe valve and the vapor valve.

Asco Torsion Spring Journal Box Lid

A NEW TYPE of journal box lid, known as the Asco hoodless torsion type roller bearing spring lid, has been introduced recently by the Allegheny Steel Company, Brackenridge, Pa. This lid, which is applicable to any

Fig. 1.—Journal Box with Asco Torsion Type Roller Bearing Spring Lid

journal box having the standard A.R.A. box face and lug, possesses the merit of forcing the lid against the box face at the top as well as at the bottom.

Fig. 2—Asco Lid with Attached Roller Bearing Spring; also Separate Spring Retainer and Pin

The lid body is pressed from ⅛ in. steel plate with side and bottom flanges and an integral turn-down scroll. It is stiffened by special embossing and as a result of the design is of light weight. The torsion spring with its roller is attached to the pressed steel lid as shown in the illustrations. A separate spring retainer and a pin completes the list of parts required.

The application of the lid is a simple operation and may be performed by one man in a moment or two without any fitting, provided the box has an opening with a flat bearing surface and a box lug which approximates the A.R.A. dimensions. All that is necessary is to lay the lid on the box face, hold the spring retainer in position, insert the headless pin and hammer down the right hand scroll which positively locks the lid body, spring retainer and pin. The spring retainer is then snapped into its locked position by a short pinch bar inserted between the spring roller and the retainer. The only tools required are a light hammer and a small pinch bar. This lid not only reduces the weight and insures a strong and even bearing pressure between the lid on the box on all four sides of the opening, but the spring action does away with all strain on the scrolls of the lid and also overcomes the wear on the box lug.

The Rex Coach Seat

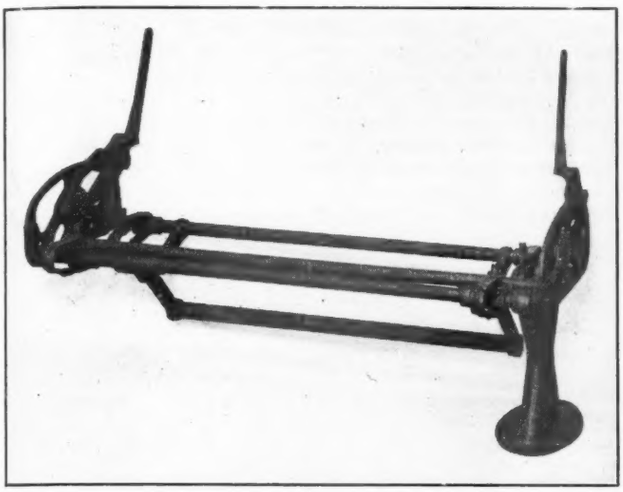
A NEW COACH SEAT of improved design has been brought out by the American Car & Foundry Company, New York. This seat, known as the Rex coach seat, is of simple and rugged construction. The number of individual parts, either fixed or operating, is small and they have been well proportioned to reduce the liability of breakage; the limited number of rivets, bolts and screws has reduced the possibilities of trouble occurring with the seat mechanism. The close tolerances in machining the operating parts eliminates rattle, while the large bearing surfaces reduce the wear and insure long life. All parts are manufactured to standards, making them interchangeable should repairs be necessary.

One Model of the Rex Coach Seat

The reversing mechanism, which is independent of the pedestal or seat end, is of the link type, provided with large pivot bearings and rigidly tied together so that in the reversing operation there is no possibility of one end lagging behind the other and consequently binding and racking the frame of the seat back.

All members subjected to stresses are of rolled or forged steel. The use of pipe for the carrying rails presents a neat and sanitary support for the cushion carrier, as well as a simple and efficient connection for these rails to the mechanism of the end castings.

The pedestals, of which several designs in pressed steel or

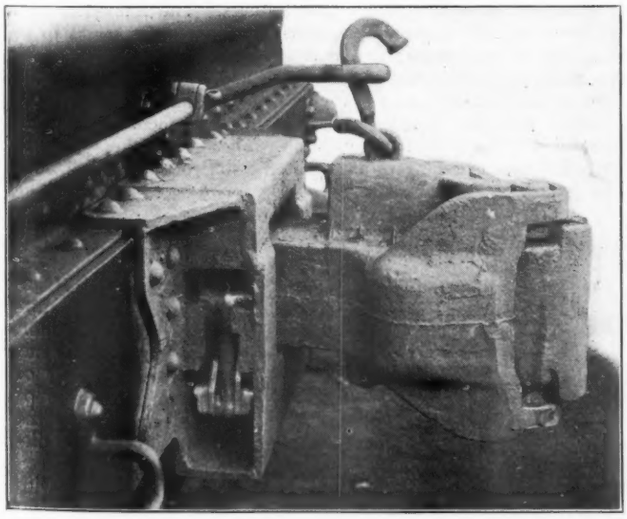


The Frame of the Rex Coach Seat Is Simple and Rugged

malleable iron are furnished, are independent of the seat rails and other mechanism. The seat ends are of double-wall pressed steel fitted with wood arm rests. Frames for cushion and back are made of either wood or steel. An automatic foot rest is also provided.

Union Coupler Centering Device

AN IMPROVED CAR COUPLER centering device has recently been developed by the Union Metal Products Company, Chicago. It consists of an integral striking casting provided with a swinging drawbar carryiron. The



Union Centering Device with Integral Striking Casting and Swinging Drawbar Carry Iron

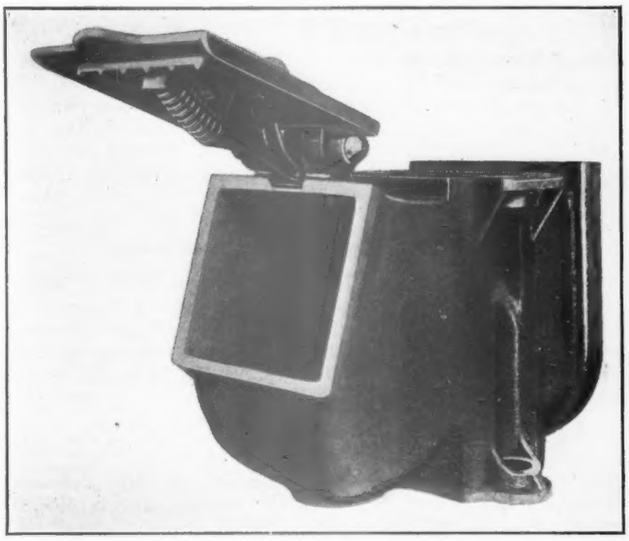
swinging carryiron is designed to keep the coupler centered at all times and is supported within the striking casting by double trunnioned links. Pins, keys and washers have been eliminated. Should the carryiron or links fail, the lower portion of the striking casting will serve as an emergency carrier and prevent the coupler dropping, averting a possible serious accident.

Coiled Spring Lid Journal Box

IMPORTANT IMPROVEMENTS in the details of construction have been made recently in the National coiled spring lid journal box manufactured by the National Malleable Castings Company, Cleveland, Ohio.

The face of the box opening in this journal box, as now furnished, is milled to insure a perfect contact with the lid. In accordance with established practice, an accurate surface also is secured on the journal box lids by placing them between two dies in a special drop hammer machine. As a result, a continuous contact between the lid and the face of the box opening is obtained around all sides of the opening and the box is consequently dust proof and oil tight when the lid is closed.

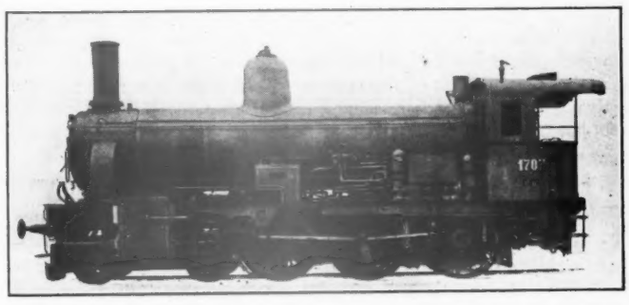
The leverage of the spring fulcrum lever has been increased. This gives a more powerful inward pull on the lid



National Journal Box with Coiled Spring Lid

when it is in the closed position and compels the lid to close from an angle of approximately 60 deg. from the box opening.

In the hinge lug, as well as in all other respects, this box conforms to the A. R. A. standard designs and requirements. Should it be necessary, in case of repairs to do so, an A. R. A. standard pressed steel or cast lid with a flat spring can be substituted for the lid with a coiled spring shown in the illustration.



Austrian 10-Wheel Locomotive, with Lentz Poppet Valves

General News Department

The conference on elimination of waste in transportation, which was to have been held at the Department of Commerce, Washington, on June 13, has been postponed until after the return of Secretary Hoover from the Alaskan trip with the presidential party.

Using a commutation ticket belonging to another was the charge against a passenger of the New York, New Haven & Hartford arraigned in court in New York City on June 5; and the accused was held in $500 bail for trial. The passenger, a resident of Port Chester, N. Y., was charged with using a ticket made out to his son.

The Brotherhood Holding Company, owned by the Brotherhood of Locomotive Engineers, has bought a controlling interest in the Federated Bank & Trust Co., of Birmingham, Ala.; and W. W. Gard, said to be a representative of the Brotherhood, has been appointed vice-president and cashier of the bank.

The Adams Express Armored Car Company has been incorporated in New York State with a capital of $1,000,000. The Adams Express Company, which, as a general express carrier, is now merged in the American Railway Express Company, has established this subsidiary to operate armored automobiles in cities for the transportation of valuables. The company has 19 such cars already in use.

S. P.-C. P. Combination Approved

The United States Circuit Court of Appeals at St. Paul, Minn., has approved the order of the Interstate Commerce Commission declaring the Southern Pacific justified in controlling the Central Pacific. Judge Walter H. Sanborn announced that counsel had been notified to appear June 18 to argue on the form of the decision.

Wage Increases

The Louisiana & Arkansas has advanced the pay of bridge and building foremen to $155 a month; section foremen, $104.80 a month; pumpers and bridge tenders $69.80 a month; carpenters, 54 cents an hour; track and shop laborers, 31 cents an hour.

The San Antonio & Aransas Pass has agreed with the United Brotherhood of M. W. employees and shop laborers to make a general increase in wages on the same general plan which is in force on other roads.

Grand Trunk Considering Provision of Suburban Service in Detroit

The Grand Trunk is considering the feasibility of providing suburban service on its line from Pontiac, Mich., to Detroit (26 miles). The use of gasoline-electric cars with trailers is contemplated in the event that a decision to provide the service is made. Before the service could be provided it would be necessary for several of the small towns through which the line passes to remove their restrictions on speed. The Grand Trunk line between these two cities is single track and, consequently, extensive suburban service could not immediately be provided. Moreover, the inauguration of the service would necessitate withholding of through freight and passenger traffic from the line during the rush hours.

C. N. R. Acquires Property in Paris

The Canadian National Railways have acquired the Hotel Scribe, a centrally located building in Paris. The guarantee of a payment of $2,000,000 was advanced by the railways. It is not the purpose of the railways to hold the property but to sell it at cost, reserving space therein under lease. It is said that a syndicate has been organized in New York to take over the property under these conditions.

The opposition in the Canadian Parliament took the occasion of this purchase as an opportunity to criticize the management of the railway, in spite of the fact that it was shown that the purchase by the C. N. R. was only a means of securing adequate space in the building and that a permanent investment of $2,000,000 in Parisian real estate was not contemplated.

Revenues and Expenses of Alaska Railroad

A deficit of $1,053,455 for the year 1922 was shown by the government's Alaska railroad, according to a statement issued by the Interior Department. The operating revenues amounted to $718,920 and the expenses to $1,772,376. During the calendar year 1923 it is anticipated that the operating expenses will be reduced by about $100,000, according to the statement, and that the operating revenues will be increased by about $200,000. A further improvement in revenues is expected in the future, when branches and spurs are constructed and a system of public highways is built in the interior. Construction of the railroad was started in 1915 and as portions were completed operation was begun. For the entire period up to December 31, 1922, the operating expenses amounted to $9,536,294 and the total operating revenues were only $2,481,069.

Needed: More Goggles

Accidents to the eyes of workmen in American industries aggregate the astonishing number of 200,000 a year, according to a statement issued by the National Committee for the Prevention of Blindness, 130 East 22nd street, New York City; and in one state, Pennsylvania, out of twelve million dollars awarded as compensation for permanent injuries since the Workmen's Compensation Act was put in force, more than 40 per cent went for compensation for loss of eyes. This sum, about $5,000,000, was greater than the combined compensation paid for loss of legs, arms and feet and for permanent disability from other injuries. The committee says that there are still innumerable plants where goggles ought to be worn, but are not worn; and many workmen who have goggles keep them in their pockets, unless they are watched. Legislation is not a sufficient means of prevention in this matter, because the workman who has goggles and does not use them can be enlightened only by persistent education. These and other points in connection with eye dangers are to be the subject of a report, soon to be issued.

Railway Employees' Magazines Association Meeting

The second annual meeting of the Railway Employees' Magazines Association was held at Atlantic City on Friday and Saturday, June 8 and 9. The president was George M. Crowson, editor, Illinois Central Magazine, and the secretary Charles E. Kane, assistant editor of the Illinois Central Magazine. A number of reports and papers were presented discussing various phases of the work of conducting railroad employees' magazines, all the way from developing reporters and correspondents to the final distribution to the employees of the finished product.

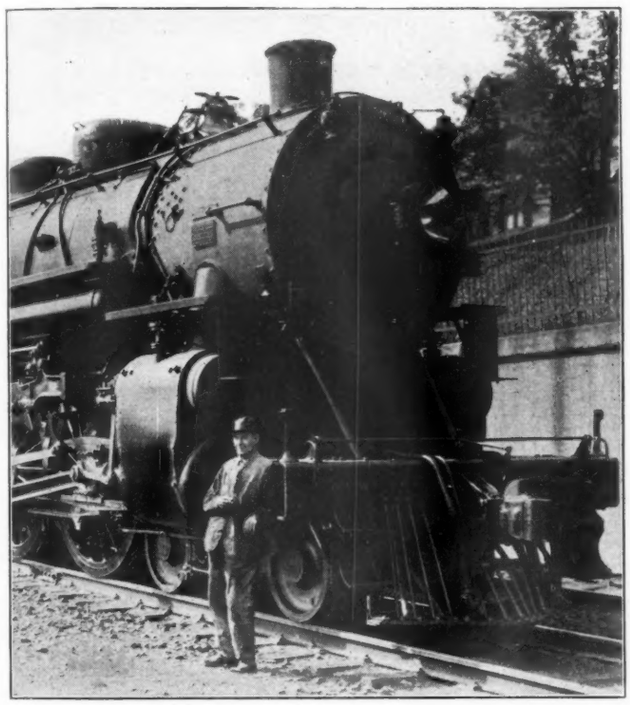
The association includes 32 magazines in its membership, with a combined circulation of over a million, 19 of the magazines being represented at the meeting. In addition to the reports, addresses were made by J. D. McCartney, assistant to the president, Central of Georgia, on the personnel problem; R. S. Binkerd, vice-chairman, Committee on Public Relations, Eastern Presidents' Conference, on public relations; and Roy V. Wright, managing editor, *Railway Age*, on employees' relations.

At the close of the meeting the following officers were elected: President, Howard Elliott, editor, Union Pacific Magazine; vice-

president, Robert M. Van Sant, editor, Baltimore & Ohio Magazine; and secretary, George Flatow, Long Island Information Bulletin. It was decided to hold the meeting next year at New Orleans.

John Draney Completes 50 Years on the Lackawanna

John Draney of the Delaware, Lackawanna & Western, who is probably the best known locomotive engineer in the East, has recently completed 50 years of service with the railroad. In recognition of this occasion, a group of officers and employees held a reception for Mr. Draney in Scranton when he completed his run on his golden anniversary. Mr. Draney started railroad work in 1873 as a water boy. For



John Draney Beside His Locomotive

many years he has been engineer on the Lackawanna Limited. When President McKinley was assassinated, he ran one of the special trains which took doctors from New York to Buffalo. Mr. Draney is president of the Lackawanna Veterans' Association.

Superintendents' Annual Convention

The American Association of Railroad Superintendents held its 30th annual convention at Kansas City, Mo., this week, approximately 100 general superintendents, superintendents and trainmasters being present at the opening session on Wednesday morning, June 13. J. F. Holden, vice-president of the Kansas City Southern addressed the meeting on Wednesday morning, emphasizing the part that transportation plays in American industrial life. M. J. Gormley, chairman of the Car Service Division of the American Railway Association described the remarkable records that the roads are now making and urged superintendents to keep this fact before their shippers.

In the election of officers for the ensuing year W. S. Williams, general superintendent of the Illinois Central at Waterloo, Iowa, was re-elected president; E. H. Harman, superintendent of the Terminal Railroad Association of St. Louis, was elected first vice-president, and G. O. Brophy, special representative of the Union Pacific, Omaha, Neb., was elected second vice-president. J. Rothschild (Terminal Railroad Association), St. Louis, was re-elected secretary-treasurer, and Charles Burlingame, superintendent of the Terminal Railroad Association, St. Louis, was re-elected chairman of the executive committee.

At the annual dinner on Wednesday evening addresses were made by W. G. Bierd, president of the Chicago & Alton; Samuel O. Dunn, editor of the *Railway Age*, and W. J. Bailey, governor of the Federal Reserve Bank, Kansas City.

A complete report of the convention will appear in the next issue of the *Railway Age*.

President Harding's Proposed Journey and His Policy Regarding the Railroads

Various published reports as to transportation policies that President Harding proposes to urge in speeches on his trip across the country en route to Alaska, and particularly the statements that he will advocate an amendment of the transportation act to provide for compulsory consolidations, have been discredited at the White House, on the highest authority. The reports referred to have been based on questions put to senators and others that have called on the President recently. It was stated that the President is still in good voice, that he sees the newspaper men twice a week, and that if he wishes to announce any policy with relation to transportation legislation he feels qualified to do so for himself. It is expected that the President will devote at least one speech to the subject of transportation, possibly at Kansas City.

Revenues and Expenses for April

The Interstate Commerce Commission's summary of revenues and expenses for Class I railroads for April and four months follows:

	April		Four months	
	1923	1922	1923	1922
Average number of miles operated	235,328.30	235,480.20	235,647.57	235,458.26
Revenues:				
Freight	$386,136,312	$288,900,101	$1,478,238,658	$1,215,028,818
Passenger	[1]87,872,206	[2]83,486,891	[3]346,363,941	[4]321,418,403
Mail	7,594,438	7,514,472	30,253,674	29,630,897
Express	14,012,560	12,999,543	49,101,859	35,218,421
All other transportation	16,669,701	14,578,057	62,002,776	53,155,754
Incidental	10,268,872	8,844,515	39,492,631	32,917,106
Joint facility—Cr.	854,292	980,621	3,342,335	3,267,348
Joint facility—Dr.	241,204	163,852	934,124	688,569
Railway operating revenues	523,167,177	417,140,348	2,007,861,750	1,689,948,178
Expenses:				
Maintenance of way and structures	65,224,501	59,211,633	223,606,648	207,846,922
Maint. of equipment	119,856,531	96,074,779	481,319,620	387,879,755
Traffic	7,530,694	6,991,617	30,065,028	28,146,152
Transportation	194,987,502	157,784,242	805,494,777	670,351,497
Miscellaneous operations	3,959,457	3,730,031	15,882,423	14,695,035
General	13,257,132	13,070,148	53,109,586	52,802,617
Transportation for investment—Cr.	757,700	437,415	2,591,628	1,750,417
Railway operating expenses	404,058,117	336,425,035	1,606,886,454	1,359,971,561
Net revenue from railway operations	119,109,060	80,715,313	400,975,296	329,976,617
Railway tax accruals	27,541,511	24,906,998	103,845,907	95,276,274
Uncollectible railway revenues	159,928	112,465	566,002	416,974
Railway operating income	91,407,621	55,695,850	296,563,387	234,283,369
Equipment rents—Dr. balance	6,337,934	4,366,478	23,606,153	17,885,726
Joint facility rent—Dr. balance	1,868,375	1,355,579	6,595,717	5,569,957
Net railway operating income	83,201,312	49,973,793	266,361,517	210,827,686
Ratio of expenses to revenues (per cent)	77.23	80.65	80.03	80.47

[1]Includes $2,808,887, sleeping and parlor car surcharge.
[2]Includes $2,528,827, sleeping and parlor car surcharge.
[3]Includes $11,046,817, sleeping and parlor car surcharge.
[4]Includes $9,482,441, sleeping and parlor car surcharge.

P. R. R. Women's Aid

The Women's Aid of the Pennsylvania Railroad now has a membership of nearly 100,000 and on the New Jersey Division alone the total is 31,887. This division plans to hold in New York City on Saturday evening, October 30, an entertainment and dance in the Seventy-first Regiment Armory, similar to that which was held a year ago and which was attended by over 8,000 members of the aid. Preparatory to formulating plans for this annual entertainment, 300 members of the New Jersey Division assembled at a luncheon in the Hotel Pennsylvania, New York, on June 7; and the luncheon itself was a considerable entertainment, a musical program being carried out by professional and

(*Continued on page* 1498)

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF APRIL AND FOUR MONTHS OF CALENDAR YEAR 1923

Name of road		Average mileage operated during period.	Operating revenues			Operating expenses						Operating ratio.	Net from railway operation.	Operating income (or loss).	Net after rentals.	Net after rentals 1922.
						Maintenance of—										
			Freight.	Passenger.	Total (inc. misc.)	Way and structures.	Equipment.	Traffic.	Transportation.	General.	Total.					
Akron, Canton & Youngstown	April	170	$213,077	$830	$223,762	$35,440	$17,140	$7,677	$63,306	$8,776	$132,339	59.10	$91,423	$76,123	$53,524	$29,872
	4 mos.	170	788,115	3,608	833,749	116,169	76,479	29,794	249,686	35,439	507,567	60.90	326,182	270,392	183,499	179,713
Alabama & Vicksburg	April	141	204,485	56,370	281,034	46,531	56,492	9,631	94,422	14,175	223,395	79.50	57,639	23,202	28,177	35,323
	4 mos.	141	822,327	218,426	1,121,722	159,445	214,813	36,875	411,916	48,520	879,001	78.40	242,721	135,467	173,094	106,800
Vicksburg, Shreveport & Pac	April	188	242,957	97,059	369,008	46,116	58,603	12,269	114,659	15,881	256,134	67.70	118,874	80,463	72,260	36,181
	4 mos.	175	934,544	366,263	1,416,673	180,418	243,148	42,757	473,351	55,050	1,004,918	70.90	411,775	295,793	254,283	119,785
Ann Arbor	April	293	431,119	39,488	488,375	53,245	90,220	8,586	190,268	14,205	356,575	73.00	131,800	109,323	62,703	44,247
	4 mos.	293	1,311,778	152,973	1,532,855	173,317	437,325	35,067	790,604	53,451	1,489,714	97.20	43,141	—46,705	—192,555	144,625
Atchison, Topeka & Santa Fe	April	8,947	11,491,145	3,392,593	16,358,057	2,377,204	4,002,911	305,415	5,211,669	333,215	12,182,656	74.50	4,175,401	2,881,695	3,124,855	1,697,292
	4 mos.	8,945	44,050,586	14,103,758	63,529,198	6,945,998	15,350,022	1,150,505	20,752,581	1,366,389	45,332,562	71.40	18,196,636	13,163,760	14,099,891	6,770,869
Gulf, Colorado & Santa Fe	April	1,908	1,263,798	315,406	1,720,821	342,849	471,110	45,497	625,910	59,279	1,543,282	89.70	177,539	97,430	53,093	81,930
	4 mos.	1,908	5,523,113	1,230,269	7,232,730	1,441,596	1,889,887	179,916	2,574,341	253,364	6,331,794	87.50	900,936	575,814	372,236	—258,301
Panhandle & Santa Fe	April	858	490,341	111,074	649,258	95,139	237,525	8,373	214,212	17,136	572,021	88.10	77,237	46,223	18,609	—30,262
	4 mos.	858	1,870,374	426,850	2,442,702	350,052	812,535	31,612	814,785	72,858	2,078,730	85.10	363,972	260,284	151,703	—123,309
Atlanta & West Point	April	93	151,240	74,345	253,166	63,022	28,353	9,712	75,428	12,191	192,614	76.10	60,552	41,981	34,465	40,263
	4 mos.	93	571,375	294,884	969,478	150,260	154,185	36,104	332,917	46,385	734,188	75.70	235,290	171,477	133,163	29,906
Western of Alabama	April	133	163,111	69,369	254,651	37,754	32,613	10,723	70,641	12,045	166,861	65.50	87,790	67,962	65,898	41,712
	4 mos.	133	622,508	272,112	977,786	124,790	170,497	40,458	310,249	46,046	704,061	72.00	273,725	210,317	200,525	79,100
Atlanta, Birmingham & Atlantic	April	639	309,132	43,218	382,132	72,137	90,868	19,767	201,448	14,774	399,164	104.40	—17,032	—29,679	—36,539	—60,885
	4 mos.	639	1,310,191	172,787	1,581,520	267,748	355,260	88,462	809,664	60,109	1,581,663	100.00	—143	—54,131	—97,249	—292,209
Atlantic Coast Line	April	4,859	5,074,150	1,557,352	7,250,514	849,272	1,496,608	108,189	2,554,289	149,403	5,198,623	71.70	2,051,891	1,676,477	1,479,169	1,911,287
	4 mos.	4,859	20,631,662	7,263,957	30,011,673	3,048,786	5,508,005	450,464	10,314,091	572,252	20,080,855	66.90	9,930,818	8,477,603	7,932,194	6,351,547
Charleston & Western Carolina	April	342	302,413	34,184	352,392	43,149	49,441	7,394	139,230	7,200	246,158	69.80	106,234	95,103	63,973	63,527
	4 mos.	342	1,185,858	137,462	1,379,770	186,039	173,289	27,907	552,141	26,833	965,953	70.00	413,817	369,639	290,781	212,934
Baltimore & Ohio	April	5,212	17,897,560	2,390,438	21,675,358	2,190,888	5,671,634	304,197	7,746,919	468,132	16,508,453	76.20	5,166,905	4,333,683	4,011,487	2,734,034
	4 mos.	5,212	69,845,803	8,832,219	83,672,001	8,482,054	19,972,521	1,254,638	32,115,207	1,900,276	64,211,531	76.70	19,460,470	16,132,214	14,524,143	9,409,476
Baltimore & Ohio Chic. Term	April	83	.....	.....	337,310	33,493	39,194	1,903	176,772	10,186	265,212	78.60	72,098	31,375	46,332	71,062
	4 mos.	83	.....	.....	1,215,267	81,021	156,798	8,238	730,793	39,899	1,032,804	85.00	182,463	12,615	170,234	368,005
Staten Island Rapid Transit	April	23	110,334	91,802	224,927	23,665	30,356	1,697	109,591	13,914	179,223	79.70	45,704	33,190	15,195	—32,227
	4 mos.	23	340,294	332,369	742,407	108,389	140,749	7,150	451,577	54,513	762,378	102.70	—19,971	—85,227	—153,810	—192,755
Bangor & Arcostook	April	616	646,950	87,142	756,326	99,366	122,647	5,210	197,944	18,455	445,079	60.20	311,247	242,542	295,926	315,659
	4 mos.	616	2,003,173	317,988	2,411,660	479,222	490,758	18,460	800,129	71,274	1,865,115	77.30	546,545	368,431	567,846	1,031,340
Belt Ry. Co. of Chicago	April	32	.....	.....	598,856	67,467	44,870	2,289	257,433	10,236	382,295	63.80	216,561	179,309	151,813	133,168
	4 mos.	32	.....	.....	2,396,605	177,130	239,930	9,175	1,130,478	39,754	1,596,467	66.60	800,138	635,461	587,559	562,363
Bessemer & Lake Erie	April	228	1,223,097	27,977	1,285,885	142,444	464,841	14,190	366,526	27,273	1,008,765	78.40	277,120	112,437	267,226	86,543
	4 mos.	228	4,386,986	121,083	4,619,604	357,464	1,655,903	58,034	1,516,812	109,554	3,703,466	80.20	916,138	663,839	1,558,636	33,131
Bingham & Garfield	April	34	38,391	.....	39,848	6,364	5,161	1,360	9,198	3,916	26,190	65.70	13,658	6,074	17,813	—6,720
	4 mos.	34	137,281	15	143,130	20,840	18,766	5,555	34,525	15,048	95,529	66.70	47,601	18,082	65,806	—78,425
Boston & Maine	April	2,286	4,968,508	1,807,469	7,600,997	889,623	1,615,739	54,705	3,562,279	199,144	6,281,942	82.60	1,319,055	1,078,604	483,938	444,438
	4 mos.	2,286	16,848,625	7,338,714	27,300,482	4,094,747	6,517,606	204,801	14,775,006	849,518	26,533,676	97.20	766,806	—182,157	—2,478,423	1,577,862
Brooklyn Eastern District Term	April	9	145,919	.....	155,344	6,071	11,476	817	51,932	4,830	75,126	48.40	80,218	63,011	63,011	46,061
	4 mos.	9	552,893	.....	590,676	21,508	54,513	1,429	201,275	21,187	299,912	50.80	290,764	249,642	249,642	190,365
Buffalo & Susquehanna	April	253	180,598	5,564	189,521	32,728	74,055	2,424	60,983	8,213	178,403	94.10	11,118	1,918	47,259	—14,061
	4 mos.	253	935,586	24,275	974,280	141,514	314,538	8,506	317,292	34,198	816,048	83.80	158,232	103,931	312,346	127,742
Buffalo, Rochester & Pittsburgh	April	589	1,447,015	143,101	1,656,300	294,551	569,134	27,369	657,945	44,840	1,596,098	96.40	60,202	25,182	197,358	—106,200
	4 mos.	589	7,166,179	588,479	8,009,836	935,301	2,827,396	103,646	3,120,010	172,821	7,167,892	89.50	841,944	701,731	1,142,772	649,943
Canadian Pacific, Lines in Maine	April	233	234,155	47,655	296,012	31,783	49,216	4,334	124,900	3,737	213,970	72.30	82,042	67,042	55,963	56,278
	4 mos.	233	1,032,127	160,753	1,258,866	106,156	229,406	17,906	584,733	15,499	953,700	75.80	305,166	245,166	200,154	133,302
Carolina, Clinchfield & Ohio	April	309	800,026	44,085	861,128	76,331	220,408	25,289	232,988	18,567	573,355	66.60	287,773	237,477	283,758	229,855
	4 mos.	309	2,825,558	163,114	3,043,563	256,457	807,294	99,199	892,032	76,229	2,130,176	70.00	913,387	712,913	894,527	896,443
Central of Georgia	April	1,920	1,547,013	436,583	2,200,894	276,728	469,256	62,539	851,402	77,781	1,745,751	79.30	455,143	354,188	352,158	287,794
	4 mos.	1,920	6,343,242	1,835,709	8,997,061	1,072,464	1,736,721	275,585	3,487,816	313,968	6,923,150	76.90	2,073,911	1,635,730	1,598,743	1,048,268
Central of New Jersey	April	694	3,870,274	693,158	4,874,036	375,839	1,268,132	34,383	2,047,808	103,283	3,848,584	78.90	1,025,452	750,766	663,538	286,507
	4 mos.	694	14,566,488	2,689,285	18,351,916	1,690,178	4,762,213	155,857	8,451,955	411,804	15,549,363	84.70	2,802,553	1,613,908	1,344,458	1,887,772
Central Vermont	April	533	668,910	102,757	852,354	83,439	123,646	9,092	426,770	20,050	664,832	78.00	187,522	167,030	84,754	27,867
	4 mos.	533	2,094,250	425,811	2,776,539	305,248	517,230	49,482	1,697,268	79,663	2,655,779	95.70	120,760	38,635	—247,194	—40,535
Chesapeake & Ohio	April	2,552	6,836,427	937,778	8,243,341	989,358	2,250,249	80,573	2,641,719	185,820	6,178,022	74.90	2,065,319	1,748,735	1,811,267	1,414,269
	4 mos.	2,552	25,712,038	3,384,687	30,685,219	3,486,150	8,485,427	332,020	10,913,533	725,600	24,054,970	78.40	6,630,249	5,400,752	5,640,488	5,618,682
Chicago & Alton	April	1,050	1,944,483	509,066	2,675,303	302,319	698,951	61,329	919,519	54,917	2,048,639	76.60	626,664	542,479	442,433	—14,734
	4 mos.	1,051	7,954,864	2,054,237	10,881,008	1,102,846	3,051,011	232,729	3,945,504	230,360	8,608,216	79.10	2,272,792	1,932,757	1,501,334	1,139,566
Chicago & Eastern Illinois	April	945	1,812,345	378,847	2,371,367	268,682	735,691	46,792	902,080	64,332	2,030,173	85.60	341,194	220,480	307,219	—54,559
	4 mos.	945	7,558,022	1,525,864	9,789,594	942,805	2,967,401	180,929	3,876,804	272,403	8,289,261	84.70	1,500,333	1,056,721	1,385,039	1,009,228
Chicago & North Western	April	8,462	9,011,128	2,276,803	12,621,717	1,622,125	3,216,571	159,483	5,531,878	335,593	10,912,935	86.50	1,708,782	951,904	698,048	1,010,937
	4 mos.	8,462	35,988,834	9,204,539	50,054,474	5,314,861	12,785,691	668,025	23,041,564	1,340,198	43,377,625	86.70	6,676,849	3,663,095	2,688,381	2,723,106
Chicago, Burlington & Quincy	April	9,393	10,672,366	2,059,503	14,397,445	2,103,459	2,990,587	218,812	5,126,141	351,616	10,864,411	75.50	3,533,034	2,610,395	2,425,005	1,198,999
	4 mos.	9,393	43,744,380	8,383,405	57,521,303	5,481,779	13,198,422	816,080	22,496,177	1,436,780	43,833,939	76.20	13,687,364	9,971,798	9,285,426	7,651,058
Chicago Great Western	April	1,496	1,625,303	336,447	2,162,969	346,363	453,478	61,291	900,215	55,204	1,826,598	84.50	336,371	257,983	123,384	—67,921
	4 mos.	1,496	6,336,805	1,372,792	8,367,411	875,765	1,924,918	257,160	3,730,115	219,716	7,057,508	84.40	1,309,903	989,537	583,845	—80,312

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF APRIL AND FOUR MONTHS OF CALENDAR YEAR 1923—CONTINUED

Name of road		Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	General.	Total.	Operating ratio.	Net from railway operation.	Operating income (or loss).	Net after rentals.	Net after rentals 1922.
Chicago, Indianapolis & Louisville	April	657	$1,134,450	$272,240	$1,552,587	$145,524	$371,746	$33,294	$551,581	$33,130	$1,150,025	74.10	$402,562	$320,291	$163,184	$140,454
	4 mos.	657	4,417,640	991,317	5,956,496	530,750	1,320,437	129,922	2,261,881	137,203	4,439,624	74.50	1,516,872	1,218,829	670,178	565,581
Chicago, Milwaukee & St. Paul	April	11,011	10,726,753	1,916,699	14,112,364	2,059,532	3,409,338	164,455	5,724,739	304,828	11,717,231	83.00	2,395,133	1,603,645	1,066,294	216,635
	4 mos.	11,021	42,804,403	7,530,473	55,720,572	5,656,800	14,075,652	730,976	23,667,229	1,249,049	45,598,594	81.80	10,121,978	6,957,056	5,038,759	—71,268
Chicago, Peoria & St. Louis	April	247	86,530	11,223	107,887	21,801	19,543	1,582	60,233	8,211	111,370	103.20	—3,483	—12,983	—18,930	—70,350
	4 mos.	247	384,004	56,206	477,593	78,241	96,473	11,020	281,848	37,088	504,670	105.70	—27,077	—65,161	—113,791	—146,223
Chicago River & Indiana	April	28	.....	.....	623,066	55,377	74,431	382	237,898	10,497	378,585	60.80	244,475	207,157	281,639	.....
	4 mos.	28	.....	.....	2,502,558	207,308	292,056	4,437	1,006,804	43,493	1,554,098	62.10	948,460	795,795	1,123,738	.....
Chicago, Rock Island & Pacific	April	7,635	7,372,327	2,037,672	10,191,045	1,323,290	2,339,165	185,625	4,217,671	259,097	8,373,899	82.20	1,817,146	1,312,941	947,967	531,521
	4 mos.	7,635	28,291,463	8,091,061	39,240,706	4,963,888	9,450,490	756,502	17,544,528	994,302	33,907,258	86.40	5,333,442	3,296,072	1,993,112	2,177,048
Chicago, Rock Island & Gulf	April	461	296,218	69,114	403,722	86,509	83,988	12,832	211,438	15,656	411,503	101.90	—7,781	—20,051	—34,354	21,272
	4 mos.	461	1,236,029	287,608	1,669,545	298,755	306,261	50,842	877,173	57,865	1,595,462	95.60	74,083	24,539	—26,472	135,838
Chic., St. Paul, Minn. & Omaha	April	1,749	1,676,273	495,001	2,342,943	239,952	503,362	33,136	1,038,612	68,001	1,890,017	80.70	452,926	317,011	342,631	199,498
	4 mos.	1,749	6,649,999	2,016,709	9,282,265	851,689	1,981,459	139,202	4,598,613	278,155	7,881,540	84.90	1,400,725	852,092	923,613	458,795
Cincinnati, Indianapolis & Western	April	347	301,459	30,440	361,506	46,018	79,228	11,963	147,790	19,595	305,819	84.60	55,687	37,185	21,017	—32,621
	4 mos.	347	1,299,962	149,903	1,574,216	141,445	339,678	45,701	708,269	76,272	1,317,354	83.70	256,862	179,702	67,283	—39,977
Colorado & Southern	April	1,099	777,966	143,388	985,954	101,185	294,935	12,054	407,752	42,421	864,081	87.60	121,873	57,876	67,113	183,723
	4 mos.	1,099	3,163,012	571,368	4,008,129	439,860	1,265,671	52,882	1,711,078	171,123	3,670,197	91.60	337,932	81,070	103,026	553,681
Ft. Worth & Denver City	April	456	528,405	134,102	708,870	99,797	196,240	13,614	229,964	36,085	577,844	81.50	131,026	88,658	137,456	212,504
	4 mos.	456	2,071,809	569,249	2,793,512	278,189	757,284	45,146	919,696	138,849	2,147,441	76.90	646,071	476,564	633,575	678,110
Wichita Valley	April	271	76,670	20,378	104,114	21,743	10,420	89	39,342	1,241	72,755	69.90	31,359	25,611	14,275	14,455
	4 mos.	264	313,306	72,002	410,920	76,187	50,462	182	161,531	6,503	294,685	71.70	116,235	92,004	50,995	40,596
Columbus & Greenville	April	167	80,590	26,214	114,315	36,077	18,168	2,595	43,810	13,009	113,613	99.40	702	—1,874	—14,421	5,644
	4 mos.	167	347,451	114,838	490,608	135,237	65,398	12,637	178,780	42,247	434,191	88.50	56,417	65,234	12,861	—9,985
Delaware & Hudson	April	886	3,516,060	273,958	4,050,695	374,885	983,426	36,717	1,657,359	136,725	3,218,649	79.50	832,046	747,158	696,349	11,201
	4 mos.	886	12,005,581	1,189,985	14,091,001	1,413,301	4,365,836	148,885	6,750,581	560,601	13,359,628	94.80	731,373	390,614	187,718	2,005,953
Delaware, Lackawanna & Western	April	993	4,993,494	1,069,580	6,922,323	707,900	1,718,370	78,845	3,172,238	146,436	5,877,991	84.90	1,044,332	632,413	704,413	716,223
	4 mos.	993	19,844,216	4,266,817	27,360,754	2,340,574	7,706,358	398,284	12,883,425	614,007	24,152,868	88.30	3,207,886	1,559,984	1,952,288	3,891,793
Denver & Rio Grande Western	April	2,593	1,853,632	385,635	2,469,571	345,208	747,829	49,798	946,542	81,215	2,209,621	89.50	259,950	92,059	177,345	219,894
	4 mos.	2,593	7,547,394	1,521,826	9,927,572	1,113,780	3,241,138	190,724	4,045,965	328,924	9,075,692	91.40	851,880	177,772	390,762	1,848,273
Denver & Salt Lake	April	255	130,512	17,362	166,558	36,288	71,391	1,191	76,993	6,335	192,198	115.40	—25,640	—34,662	—31,845	—58,650
	4 mos.	255	459,940	53,405	592,011	142,715	298,723	3,892	264,052	24,058	733,440	123.90	—141,429	—177,530	—158,715	7,237
Detroit & Mackinac	April	385	113,400	30,074	154,728	25,345	44,868	2,062	62,443	6,280	140,969	91.10	13,759	4,248	13,188	—16,381
	4 mos.	385	406,482	117,959	563,811	85,570	182,480	7,900	252,657	22,126	550,532	97.60	13,279	—29,346	12,167	—121,855
Detroit & Toledo Shore Line	April	61	385,708	.....	390,578	30,550	28,432	1,978	100,901	6,648	168,509	43.10	222,069	203,769	107,823	18,180
	4 mos.	61	1,411,697	.....	1,422,905	97,634	117,990	9,313	421,846	26,999	673,782	47.00	759,123	685,923	327,105	345,673
Detroit, Toledo & Ironton	April	454	840,695	8,682	862,589	127,732	98,584	6,278	288,027	23,447	534,072	61.90	328,517	315,947	181,986	141,063
	4 mos.	454	3,137,896	38,424	3,239,550	382,485	580,222	25,676	1,208,285	93,299	2,238,464	69.10	1,001,086	950,704	472,718	475,419
Duluth & Iron Range	April	279	142,569	26,601	186,007	77,371	127,587	1,388	136,705	17,391	360,888	194.00	—174,881	—211,371	—207,366	—104,802
	4 mos.	279	591,180	83,567	772,607	254,604	502,895	4,467	618,629	70,574	1,452,936	188.20	—680,929	—753,210	—754,308	—572,949
Duluth, Messabe & Northern	April	305	203,447	25,455	263,181	152,978	221,747	2,831	184,092	19,406	582,647	221.40	—319,466	—399,723	—403,361	—363,930
	4 mos.	305	520,566	94,712	732,418	450,591	811,042	11,602	724,600	82,184	2,086,567	284.90	—1,354,149	—1,663,879	—1,669,917	—1,290,175
Duluth, South Shore & Atlantic	April	591	363,190	92,789	484,163	53,369	70,126	6,415	251,196	12,632	399,338	82.50	84,825	56,821	25,446	—33,604
	4 mos.	591	1,228,732	369,429	1,716,018	186,937	294,300	25,153	971,761	47,623	1,547,576	90.20	168,442	50,419	—13,509	—255,311
Duluth, Winnipeg & Pacific	April	178	178,209	23,411	211,399	30,997	54,046	2,664	95,108	6,010	188,825	89.30	22,574	815	3,503	—5,477
	4 mos.	178	814,262	96,245	938,791	123,141	180,752	12,819	406,019	22,482	744,495	79.30	194,296	102,604	115,463	—15,811
Elgin, Joliet & Eastern	April	459	2,278,833	21	2,523,090	175,309	642,127	15,331	762,818	35,141	1,630,591	64.60	892,499	773,168	570,321	379,212
	4 mos.	459	8,361,601	52	9,285,099	587,671	2,474,133	51,165	2,964,005	143,038	6,219,677	67.00	3,065,422	2,721,339	2,032,832	2,051,763
El Paso & Southwestern	April	1,139	934,900	166,018	1,162,350	179,733	212,608	32,152	279,745	39,620	752,868	64.80	409,482	298,319	294,210	127,861
	4 mos.	1,139	3,245,580	712,704	4,181,917	749,854	847,636	122,314	1,125,752	162,359	3,046,360	72.80	1,135,557	773,140	750,651	481,183
Erie	April	2,039	7,991,846	1,072,761	9,804,417	967,376	2,570,152	106,529	3,720,047	274,366	7,682,879	78.40	2,121,538	1,779,820	1,821,539	527,829
	4 mos.	2,039	33,073,033	4,106,075	39,830,170	3,481,175	11,457,530	524,358	17,359,073	1,101,296	34,102,277	85.60	5,727,893	4,425,568	4,509,883	3,674,186
Chicago & Erie	April	269	1,111,559	54,587	1,234,075	98,606	219,075	19,146	448,801	35,279	821,910	66.60	412,165	359,541	41,987	—15,086
	4 mos.	269	3,921,368	200,525	4,390,905	380,946	809,915	79,474	1,917,220	149,880	3,337,464	76.00	1,053,441	848,673	—404,048	—471,179
New Jersey & New York	April	45	23,806	98,636	128,286	11,852	18,573	1,258	61,887	3,659	97,229	75.80	31,057	27,725	—1,819	—3,234
	4 mos.	45	110,991	373,676	505,876	49,906	89,926	5,244	285,184	15,300	445,556	88.10	60,320	46,899	—64,737	—43,337
N. Y., Susuehanna & West'n.	April	135	297,139	59,176	402,773	44,392	73,312	3,467	207,144	11,768	340,011	84.40	62,762	31,386	21,155	—46,765
	4 mos.	135	1,231,373	236,109	1,672,333	184,456	304,517	14,395	967,911	46,797	1,518,064	90.80	154,269	28,790	17,233	32,855
Evansville, Indianap. & T. Haute	April	140	105,517	5,941	118,420	39,861	12,660	1,889	55,567	2,857	112,834	95.30	5,586	1,352	—31,828	—31,213
	4 mos.	140	498,706	28,424	554,197	136,033	42,660	7,401	243,013	12,359	440,191	79.40	114,006	97,073	—49,086	—121,639
Florida East Coast	April	764	1,050,777	403,319	1,623,079	161,824	199,832	11,888	430,417	29,579	845,570	52.10	777,509	662,255	579,966	610,858
	4 mos.	764	3,715,493	2,368,717	6,858,575	706,968	798,671	66,054	1,860,080	119,442	3,624,111	52.80	3,234,464	2,893,621	2,608,042	2,073,632
Fort Smith & Western	April	249	103,286	21,636	134,517	25,458	27,389	4,793	43,369	7,350	109,116	81.10	25,401	19,484	14,762	—5,869
	4 mos.	249	407,916	89,178	535,502	89,289	113,754	19,232	188,150	29,249	442,690	82.70	92,812	69,306	47,764	—29,487

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF APRIL AND FOUR MONTHS OF CALENDAR YEAR 1923—CONTINUED

Name of road		Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	General.	Total.	Operating ratio.	Net from railway operation.	Operating income (or loss).	Net after rentals.	Net after rentals 1922.
Georgia	April	328	$385,564	$101,595	$522,356	$51,961	$87,275	$21,040	$218,890	$20,433	$399,505	76.50	$122,851	$116,167	$102,805	$80,931
	4 mos.	328	1,454,094	392,543	1,967,379	202,923	364,828	83,129	871,176	77,090	1,599,225	81.30	368,154	342,074	312,352	152,937
Georgia & Florida	April	405	104,253	18,211	130,561	17,237	17,055	7,816	56,863	7,144	106,324	81.40	24,237	17,474	10,723	—1,518
	4 mos.	405	472,800	73,240	577,413	71,898	74,797	32,751	239,260	27,929	447,484	77.50	129,929	104,026	67,820	—13,334
Grand Trunk Western	April	347	1,620,606	173,819	1,879,933	147,149	309,137	25,139	640,806	46,970	1,175,416	62.50	704,517	644,589	382,783	—125,507
	4 mos.	347	5,286,992	683,434	6,306,947	399,849	1,225,435	112,700	2,572,663	192,216	4,530,417	71.80	1,776,530	1,536,918	596,212	—532,640
Atlantic & Saint Lawrence	April	166	265,931	35,215	318,268	43,772	52,247	4,620	133,179	6,408	241,236	75.80	77,032	61,882	—55,982	—184,822
	4 mos.	166	1,088,554	134,164	1,287,895	187,662	255,396	15,563	887,112	30,179	1,379,021	107.10	—91,126	—151,779	—605,714	—318,777
Chic., Det. & Canada Gr. Tr. Jct.	April	59	269,577	8,843	312,300	12,490	16,465	2,879	89,353	3,320	124,476	39.90	187,824	180,209	147,416	74,388
	4 mos.	59	915,900	36,971	1,088,047	40,972	83,096	13,335	358,504	14,039	509,886	59.55	578,161	547,683	439,805	287,568
Det., Grand Haven & Milwaukee	April	189	493,227	43,669	588,873	82,489	61,881	7,308	256,303	15,202	423,512	71.90	165,361	160,367	68,525	—18,455
	4 mos.	189	1,679,589	166,383	2,032,272	205,865	301,926	33,470	1,047,152	59,522	1,649,576	81.20	382,696	361,728	47,250	—97,976
Great Northern	April	8,255	6,227,703	1,163,963	8,162,800	1,443,311	2,014,919	180,099	3,477,026	205,292	7,302,564	89.50	860,236	168,950	432,212	707,964
	4 mos.	8,255	25,324,017	4,577,920	32,598,730	4,056,497	7,993,754	589,398	15,924,141	807,988	29,482,462	89.30	3,516,268	770,753	1,594,506	1,308,447
Green Bay & Western	April	234	77,172	19,054	103,163	11,778	24,007	2,768	43,831	2,888	85,272	77.60	17,891	9,891	13,601	—4,140
	4 mos.	234	313,298	69,405	417,151	58,539	89,778	10,365	186,179	11,807	356,451	85.40	60,760	28,700	48,446	51,655
Gulf Coast Lines	April	922	694,249	154,594	906,565	145,865	135,784	28,422	266,951	35,544	607,501	67.00	299,063	246,576	232,301	215,592
	4 mos.	922	2,765,534	644,199	3,612,491	575,027	560,078	112,130	1,025,505	139,285	2,404,726	66.60	1,207,765	1,001,780	943,530	920,618
Gulf & Ship Island	April	307	213,420	37,625	268,536	47,458	36,192	7,420	79,330	13,800	185,266	69.00	83,270	59,384	45,466	43,781
	4 mos.	307	826,671	145,008	1,033,183	166,368	144,859	31,117	317,953	54,439	717,710	69.50	315,473	217,339	186,215	135,482
Gulf, Mobile & Northern	April	433	430,183	37,500	486,941	59,678	91,743	16,163	171,666	14,492	353,400	72.50	133,541	106,271	88,859	99,312
	4 mos.	433	1,658,303	144,805	1,873,424	249,336	324,848	67,108	669,379	66,669	1,375,931	73.40	497,493	397,966	328,063	260,908
Hocking Valley	April	348	1,229,336	89,798	1,394,690	112,409	474,964	13,002	410,731	34,421	1,044,628	74.90	350,062	268,388	298,873	131,377
	4 mos.	348	4,461,603	359,491	5,084,112	464,618	1,890,201	51,961	1,717,763	136,378	4,256,480	83.70	827,632	500,657	707,755	967,674
Illinois Central	April	4,839	11,266,490	2,095,506	14,628,471	1,840,753	3,609,156	195,445	5,353,968	324,852	11,381,827	77.80	3,246,644	2,409,423	2,325,096	1,469,521
	4 mos.	4,839	45,051,015	8,568,823	57,540,725	6,931,154	13,299,024	800,000	21,906,487	1,266,018	44,328,781	77.00	13,211,944	9,753,438	9,509,787	7,546,191
Yazoo & Mississippi Valley	April	1,380	1,146,591	332,689	1,586,226	420,177	405,267	24,976	657,325	45,481	1,553,502	97.90	32,724	—78,423	—93,277	23,699
	4 mos.	1,380	5,002,873	1,340,960	6,695,565	1,476,998	1,488,380	95,295	2,700,221	175,665	5,909,519	88.30	786,046	341,902	295,499	102,145
International & Great Northern	April	1,159	780,780	192,001	1,091,904	231,856	227,547	27,636	442,482	37,644	971,416	88.97	120,488	87,825	47,991	139,982
	4 mos.	1,159	3,359,284	735,272	4,533,911	825,996	885,883	113,137	1,868,893	187,098	3,901,454	86.05	632,457	502,258	345,654	227,835
Kansas City, Mexico & Orient	April	272	125,138	7,052	143,801	27,701	28,870	5,811	67,399	5,268	135,049	93.30	8,752	1,203	5,660	—32,083
	4 mos.	272	427,058	27,846	494,863	126,226	118,385	20,904	264,668	20,978	551,161	111.40	—56,298	—85,546	—63,196	—97,262
Kan. City, Mex. & Orient of Tex.	April	465	112,265	7,597	127,490	32,909	39,067	5,905	81,010	5,583	164,435	129.00	—36,945	—43,153	—55,541	—84,456
	4 mos.	465	439,392	33,836	499,802	93,745	138,910	21,995	302,856	22,715	580,161	116.10	—80,359	—105,432	—162,143	—243,344
Kansas City Southern	April	767	1,272,703	160,268	1,567,467	216,196	338,941	40,428	560,357	60,866	1,216,594	77.60	350,873	262,677	225,840	257,169
	4 mos.	767	5,328,324	623,961	6,472,161	803,469	1,346,734	155,781	2,316,862	269,543	4,890,555	75.60	1,581,606	1,231,739	1,074,701	1,024,365
Texarkana & Ft. Smith	April	95	174,843	14,486	212,291	18,173	24,360	5,336	55,130	8,573	111,399	52.50	100,892	89,507	74,793	15,029
	4 mos.	95	715,119	54,708	846,376	71,221	95,424	21,142	227,409	33,461	447,803	52.90	398,573	352,615	261,945	100,116
Kansas, Oklahoma & Gulf	April	314	200,606	10,283	219,665	34,470	35,937	6,782	79,973	11,120	168,370	76.60	51,295	41,353	27,266	28,446
	4 mos.	314	881,102	43,806	956,337	147,413	158,429	26,986	364,921	43,662	741,983	77.60	214,349	174,657	98,830	146,298
Lake Superior & Ishpeming	April	33	8,058	91	9,514	22,017	14,687	267	12,440	2,401	51,812	544.60	—42,298	—46,765	—46,659	—38,881
	4 mos.	33	35,417	421	39,458	76,924	56,652	1,169	50,465	11,665	196,875	498.90	—157,417	—186,609	—180,811	—172,619
Lake Terminal	April	13	.....	.....	97,577	14,703	11,269	.....	54,832	1,807	82,611	84.70	14,966	8,716	14,420	30,467
	4 mos.	13	.....	.....	345,199	44,936	51,661	.....	216,611	6,883	320,091	93.00	25,108	—1,094	3,391	141,332
Lehigh & Hudson River	April	96	219,460	3,351	236,439	25,811	31,233	1,429	96,524	9,321	164,318	69.50	72,121	59,621	53,835	1,596
	4 mos.	96	844,946	14,094	906,382	81,309	144,719	5,934	390,520	33,829	656,311	72.40	250,071	205,571	194,545	108,621
Lehigh & New England	April	219	522,171	1,900	533,092	48,441	151,455	9,712	149,717	18,114	377,420	70.80	155,672	133,229	137,229	14,304
	4 mos.	219	1,809,238	8,532	1,849,527	158,068	611,876	34,334	601,447	68,960	1,474,590	79.70	374,937	310,408	369,434	113,068
Lehigh Valley	April	1,335	5,482,379	561,189	6,518,075	661,498	2,085,677	94,825	2,737,245	123,132	5,728,713	87.90	789,362	579,498	646,853	—205,883
	4 mos.	1,335	18,614,504	2,166,834	22,545,620	2,110,367	8,758,479	386,023	10,819,622	494,052	22,652,974	100.50	—107,354	—946,151	—1,691,291	1,956,605
Los Angeles & Salt Lake	April	1,169	1,315,332	471,098	1,933,842	382,142	435,828	50,153	601,263	49,176	1,556,317	80.50	377,525	264,376	226,116	—8,569
	4 mos.	1,165	4,811,170	1,771,078	7,147,466	1,218,919	1,769,120	187,208	2,470,752	195,189	5,994,586	83.90	1,152,880	699,254	567,990	75,514
Louisiana & Arkansas	April	302	295,038	33,078	337,568	41,245	45,720	7,458	106,903	8,376	209,017	61.90	128,551	97,054	88,130	73,248
	4 mos.	302	1,190,295	128,546	1,350,473	181,886	171,700	31,331	408,016	35,154	826,895	61.20	523,578	406,571	380,047	143,150
Louisiana Ry. & Navigation	April	343	290,223	31,664	339,696	67,040	64,368	9,995	143,791	10,805	295,787	87.10	43,909	26,581	5,102	—44,519
	4 mos.	343	1,131,786	121,449	1,325,154	264,317	240,942	43,176	527,160	45,000	1,119,935	84.50	205,219	135,109	47,549	—21,097
Louisville & Nashville	April	5,040	8,537,355	1,985,709	11,311,252	1,388,837	2,655,359	218,108	4,117,060	236,670	8,657,314	76.50	2,653,938	2,130,132	2,260,095	1,566,996
	4 mos.	5,039	33,358,611	7,742,385	43,734,279	5,391,879	10,977,227	939,206	16,697,303	931,242	35,106,480	80.30	8,627,799	6,765,942	7,199,837	4,405,472
Louisville, Henderson & St. Louis	April	199	198,611	63,448	283,679	59,972	38,580	6,699	102,418	8,888	216,557	76.30	67,122	62,310	43,103	53,412
	4 mos.	199	817,379	233,893	1,117,627	215,920	147,949	25,440	385,376	34,766	809,451	72.40	308,176	256,206	193,162	120,214
Maine Central	April	1,201	1,477,323	383,849	1,986,982	245,315	309,019	11,549	777,081	45,569	1,390,068	70.00	596,914	498,434	438,431	119,692
	4 mos.	1,201	4,814,314	1,417,456	6,729,823	1,116,522	1,250,653	50,115	3,511,019	190,474	6,120,431	90.90	609,392	214,913	80,104	448,701
Midland Valley	April	365	287,495	60,965	368,690	61,708	44,572	4,927	116,584	17,086	234,502	63.60	134,188	118,992	109,297	142,311
	4 mos.	365	1,182,945	242,658	1,493,481	195,238	212,013	20,216	482,575	64,588	963,540	64.50	529,941	468,630	428,008	450,523

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF APRIL AND FOUR MONTHS OF CALENDAR YEAR 1923—CONTINUED

Name of road		Average mileage operated during period.	Operating revenues			Operating expenses						Operating ratio.	Net from railway operation.	Operating income (or loss).	Net after rentals.	Net after rentals 1922.
			Freight.	Passenger.	Total (inc. misc.)	Maintenance of—Way and structures.	Maintenance of—Equipment.	Traffic.	Transportation.	General.	Total.					
Minneapolis & St. Louis	April	1,649	$1,136,021	$142,737	$1,351,570	$180,262	$342,128	$25,511	$603,971	$44,615	$1,196,186	88.50	$155,384	$85,838	$78,883	—$92,594
	4 mos.	1,649	4,734,505	614,876	5,612,507	681,614	1,270,141	98,203	2,558,763	178,957	4,786,661	85.30	825,846	556,307	448,651	241,141
Minneap., St. Paul & S. S. Marie	April	4,391	3,099,534	588,810	4,609,156	550,449	826,244	57,077	1,762,359	105,218	3,307,514	82.50	701,642	441,305	404,244	153,211
	4 mos.	4,383	11,777,401	2,342,942	15,216,788	1,918,111	2,945,902	217,427	7,379,882	445,940	12,926,641	84.90	2,290,147	1,252,143	1,284,378	—399,896
Mississippi Central	April	257	110,708	14,546	130,497	33,229	26,521	4,786	47,627	7,356	119,519	91.60	10,978	5,978	2,874	4,179
	4 mos.	257	520,963	57,519	599,790	90,103	92,566	21,417	204,083	27,924	436,093	72.70	163,697	141,610	137,164	37,716
Missouri & North Arkansas	April	364	98,426	19,834	127,755	32,891	16,013	2,945	55,677	7,291	104,817	82.00	22,938	18,651	11,899	—3,187
	4 mos.	364	371,310	76,581	478,651	89,859	64,721	11,401	227,543	25,309	408,855	85.40	69,818	53,175	5,071	—3,187
Missouri, Kansas & Texas	April	1,882	2,016,468	456,111	2,737,297	278,461	830,170	48,830	833,545	99,020	2,088,495	76.30	648,802	503,830	676,715	804,020
	4 mos.	1,882	8,353,190	1,869,259	11,225,465	917,156	3,572,504	212,469	3,612,767	488,650	8,822,362	78.60	2,403,103	1,811,470	2,290,724	2,596,099
Mo., Kansas & Texas of Texas	April	1,389	871,974	398,254	1,446,134	197,028	303,615	38,727	610,680	69,606	1,218,608	84.30	227,526	181,510	2,227	234,967
	4 mos.	1,651	4,081,880	1,567,987	6,303,392	811,473	1,471,486	164,455	2,847,422	349,581	5,639,127	89.50	664,265	445,033	—393,588	625,226
Wichita Falls & Northwestern	April	Included in Missouri, Kansas & Texas.														
	4 mos.	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Missouri Pacific	April	7,171	6,934,511	1,421,765	9,198,235	1,251,503	2,417,147	162,891	3,625,879	257,170	7,755,267	84.30	1,442,968	1,102,608	905,007	334,452
	4 mos.	7,171	26,048,596	5,715,986	34,805,107	4,539,100	9,047,719	613,209	14,675,100	1,046,505	30,048,055	86.30	4,757,052	3,273,468	1,921,698	1,877,497
Mobile & Ohio	April	1,165	1,451,923	155,707	1,767,955	213,674	381,402	42,939	641,279	45,225	1,324,582	77.50	383,373	286,029	264,366	268,140
	4 mos.	1,165	6,097,341	616,810	7,087,815	817,217	1,653,333	180,900	2,565,444	184,186	5,401,225	76.20	1,686,590	1,316,470	1,180,278	773,990
Monongahela	April	106	452,614	39,108	496,537	62,852	87,975	804	159,578	8,804	320,013	64.40	176,524	166,574	89,596	—30,705
	4 mos.	106	1,559,495	157,797	1,737,162	201,100	380,462	4,713	587,251	35,168	1,208,694	69.60	528,468	488,668	224,280	527,877
Monongahela Connecting	April	7	.....	.....	228,428	24,152	34,181	562	110,382	4,562	173,839	76.10	54,589	52,002	27,975	18,012
	4 mos.	7	.....	.....	854,551	92,600	146,190	2,296	466,887	18,812	726,785	85.00	127,766	119,107	35,724	112,975
Montour	April	57	211,778	595	215,158	36,261	47,501	1,152	37,783	7,572	130,269	60.50	84,889	70,067	99,434	—10,697
	4 mos.	57	647,921	2,167	658,790	95,025	180,644	4,431	151,407	28,298	459,805	69.80	198,985	157,456	278,814	34,353
Nashville, Chattanooga & St. Louis	April	1,248	1,691,561	378,121	2,221,725	301,272	451,411	68,764	824,503	61,228	1,711,870	77.10	509,855	448,551	473,226	308,506
	4 mos.	1,248	6,050,100	1,568,876	8,155,113	1,093,843	1,781,911	296,343	3,249,419	245,010	6,692,065	82.10	1,463,048	1,220,138	1,378,833	459,335
Nevada Northern	April	165	56,679	9,625	71,003	12,094	6,795	503	14,119	3,782	37,293	52.50	33,710	27,110	29,204	6,979
	4 mos.	165	204,234	31,130	254,145	46,572	21,892	1,799	53,330	13,377	136,970	53.90	117,175	90,776	98,287	—10,144
Newburgh & South Shore	April	7	.....	.....	191,383	14,765	46,713	.....	76,834	4,206	142,518	74.50	48,865	35,636	26,390	40,052
	4 mos.	7	.....	.....	693,529	47,853	194,438	.....	317,085	16,790	576,166	83.00	117,363	66,460	28,430	150,353
New Orleans Great Northern	April	274	189,930	32,173	229,628	35,949	39,407	5,319	68,777	12,862	162,696	70.90	66,932	50,246	52,344	69,068
	4 mos.	274	770,653	118,430	921,362	116,066	139,265	22,655	281,668	44,645	605,915	65.80	315,447	248,393	250,403	83,128
New York Central	April	6,899	25,131,408	7,484,182	36,698,993	3,791,552	8,145,434	324,857	12,787,384	872,262	26,287,258	71.60	10,411,735	8,111,850	7,838,524	4,273,988
	4 mos.	6,896	92,816,603	29,098,673	137,347,222	13,509,481	33,736,194	1,287,960	53,275,306	3,309,606	106,630,343	77.60	30,716,879	22,919,172	22,172,757	16,394,918
Cincinnati Northern	April	244	461,191	12,479	480,371	80,825	74,695	4,731	151,808	7,677	319,736	66.60	160,635	138,753	100,347	—11,080
	4 mos.	244	1,734,147	54,611	1,816,401	244,507	306,994	18,169	627,314	29,731	1,226,560	67.50	589,841	494,353	349,161	188,255
Cleve., Cincin., Chic. & St. Louis	April	2,407	5,997,540	1,353,094	8,002,914	850,232	1,842,230	111,033	2,802,678	181,534	5,837,915	72.90	2,164,999	1,676,817	1,622,961	1,016,441
	4 mos.	2,408	23,960,329	5,288,208	31,768,780	2,915,712	7,627,129	417,228	12,034,859	719,121	23,913,676	75.30	7,855,104	6,109,108	5,801,197	4,526,507
Indiana Harbor Belt	April	119	.....	.....	974,369	101,876	128,278	3,482	408,521	20,180	662,337	68.00	312,032	275,487	155,634	134,413
	4 mos.	120	.....	.....	3,873,356	369,292	523,542	17,939	1,835,622	83,947	2,830,342	73.10	1,043,014	948,252	445,366	647,529
Michigan Central	April	1,862	6,067,428	1,580,939	8,400,024	892,852	1,446,036	100,428	2,779,438	152,247	5,439,814	64.80	2,960,210	2,423,420	2,104,914	1,206,327
	4 mos.	1,862	22,637,511	5,936,548	31,590,552	3,033,740	6,082,475	379,041	11,264,739	577,189	21,619,001	68.40	9,971,551	8,142,224	7,102,826	3,784,616
Pittsburgh & Lake Erie	April	231	3,391,234	269,750	3,779,891	342,191	945,867	18,348	1,070,198	62,148	2,440,488	64.60	1,339,403	1,081,575	1,519,961	9,797
	4 mos.	231	13,151,649	1,020,806	14,400,587	1,301,852	3,812,321	77,156	4,338,603	250,553	9,787,791	68.00	4,612,796	3,727,836	5,320,545	—227,428
New York, Chicago & St. Louis	April	1,242	3,637,988	126,667	3,911,810	419,928	708,772	79,064	1,438,546	142,760	2,795,334	71.50	1,116,476	926,637	809,053	598,241
	4 mos.	1,242	13,558,983	498,605	14,617,945	1,427,522	3,123,923	333,861	5,849,365	503,077	11,264,262	77.10	3,353,683	2,593,959	2,205,024	2,347,156
New York, New Haven & Hartford	April	2,000	6,123,189	4,068,777	11,518,313	1,131,701	2,655,955	51,595	4,655,305	282,040	8,957,925	77.80	2,560,388	2,149,953	1,140,851	1,254,270
	4 mos.	2,000	21,089,114	15,739,812	41,996,992	4,191,674	10,356,607	218,760	18,970,911	1,125,763	35,562,702	84.70	6,434,290	4,760,234	825,441	4,828,128
Central New England	April	295	560,300	16,147	603,549	93,685	96,351	2,844	229,752	9,818	432,450	71.70	171,099	147,001	73,336	102,618
	4 mos.	295	2,030,267	70,272	2,223,456	351,156	499,526	17,736	1,009,632	45,341	1,923,391	86.50	300,065	204,355	—144,924	598,584
New York, Ontario & Western	April	569	756,680	134,685	1,060,066	123,673	250,000	14,265	525,800	32,059	946,806	89.30	113,260	70,755	31,646	16,601
	4 mos.	569	2,879,066	505,547	4,001,539	459,581	1,000,000	59,092	2,347,984	129,509	4,000,912	100.00	627	—169,739	—349,098	187,705
Norfolk & Western	April	2,237	6,721,440	803,601	7,844,989	976,215	1,878,179	76,880	2,600,293	156,002	5,703,846	72.80	2,126,143	1,649,493	2,062,536	2,315,051
	4 mos.	2,237	24,835,349	3,037,181	29,112,264	3,732,009	7,813,121	323,962	10,555,869	603,064	23,106,923	79.40	6,005,341	4,082,940	5,552,401	6,757,998
Norfolk Southern	April	931	647,504	104,625	801,281	100,211	120,911	23,126	333,023	29,560	607,287	75.80	193,994	155,646	97,647	138,418
	4 mos.	930	2,508,320	425,230	3,095,677	391,524	470,313	92,488	1,307,555	116,502	2,380,357	76.90	715,320	561,692	375,137	270,945
Northern Pacific	April	6,665	6,156,598	1,165,514	8,039,342	1,270,468	2,073,083	176,624	3,120,408	211,149	6,931,601	86.20	1,107,741	413,439	933,349	579,334
	4 mos.	6,665	23,322,767	4,657,685	30,663,857	3,535,384	8,180,924	623,557	13,394,079	856,976	26,988,461	88.00	3,675,396	887,753	3,036,539	918,136
Northwestern Pacific	April	496	299,038	195,272	554,501	103,416	105,976	6,987	215,111	19,275	452,207	81.60	102,294	53,237	40,023	106,879
	4 mos.	496	1,280,935	704,490	2,206,484	484,472	408,877	23,209	897,048	74,757	1,395,101	86.10	305,383	108,953	62,191	177,451
Pennsylvania	April	10,495	42,811,337	12,594,357	60,819,156	7,155,361	15,255,954	616,113	23,725,070	1,431,685	48,969,896	80.50	11,849,260	9,419,067	7,923,889	5,412,283
	4 mos.	10,495	156,886,578	48,486,943	226,276,895	21,190,879	61,198,262	2,480,356	94,895,525	5,708,883	188,699,202	83.40	37,577,693	29,631,416	24,932,139	28,721,524

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF APRIL AND FOUR MONTHS OF CALENDAR YEAR 1923—CONTINUED

Name of road		Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of: Way and structures.	Equipment.	Traffic.	Transportation.	General.	Total.	Operating ratio.	Net from railway operation.	Operating income (or loss).	Net after rentals.	Net after rentals 1922.
Baltimore, Chesa. & Atlantic	April	87	$76,842	$27,857	$109,926	$14,179	$55,459	$2,082	$68,929	$3,863	$144,512	131.50	—$34,586	—$37,607	—$36,499	—$24,765
	4 mos.	87	270,214	92,147	380,246	44,000	157,241	6,612	287,453	15,658	510,964	134.40	—130,718	—132,107	—132,838	—87,278
Long Island	April	397	907,065	1,433,807	2,559,338	340,978	504,454	25,537	1,171,441	61,437	2,119,146	82.80	440,192	331,503	163,195	331,988
	4 mos.	397	3,396,465	5,189,525	9,453,817	1,134,364	1,966,269	72,284	4,784,870	247,765	8,268,258	87.50	1,185,559	947,108	479,637	744,196
Maryland, Delaware & Virginia	April	82	57,699	19,762	80,782	9,909	40,359	1,895	55,632	2,194	109,989	136.20	—29,207	—30,367	—30,550	—4,582
	4 mos.	82	196,418	64,409	273,707	31,869	118,427	5,355	229,191	9,241	394,083	144.00	—120,376	—121,079	—123,837	—73,543
West Jersey & Seashore	April	359	422,462	540,182	1,047,869	184,265	207,587	12,861	474,891	26,368	916,776	87.50	131,093	74,873	53,110	95,972
	4 mos.	359	1,660,229	1,895,100	3,881,377	676,578	785,068	48,024	1,970,081	101,054	3,630,864	93.50	250,513	215,550	133,249	41,362
Peoria & Pekin Union	April	19	21,203	1,793	145,890	30,019	13,583	466	62,772	8,838	115,678	79.30	30,212	17,712	41,663	30,129
	4 mos.	19	84,301	10,879	598,060	66,301	65,441	1,779	262,402	38,369	434,292	72.60	163,768	113,768	216,445	226,569
Pere Marquette	April	2,212	3,287,713	388,803	4,020,477	420,420	829,487	49,578	1,495,435	103,154	2,898,326	72.10	1,122,151	993,140	681,647	322,206
	4 mos.	2,212	11,511,335	1,543,558	14,368,513	1,201,662	3,245,765	198,870	5,792,671	424,390	10,885,961	75.80	3,482,552	2,950,779	2,061,146	1,466,205
Philadelphia & Reading	April	1,125	8,212,666	852,585	9,523,838	870,935	1,742,771	78,965	3,089,920	148,216	5,948,793	62.50	3,575,045	3,294,179	3,149,547	492,441
	4 mos.	1,125	31,194,675	3,374,204	36,390,365	2,745,850	7,331,364	308,522	13,293,289	583,658	24,341,234	66.90	12,049,131	10,977,060	10,077,445	4,967,468
Atlantic City	April	170	109,681	155,869	278,523	44,216	44,889	3,171	244,395	4,172	340,368	122.20	—61,845	—81,430	—115,120	—23,618
	4 mos.	170	478,303	541,867	1,070,417	211,042	143,458	18,570	815,336	17,190	1,204,795	112.60	—134,378	—212,711	—332,795	—156,248
Perkiomen	April	41	55,784	6,259	65,764	6,962	4,200	106	46,963	812	59,071	89.80	6,693	—130	—5,358	36,608
	4 mos.	41	295,916	24,769	336,306	24,127	15,099	432	163,342	3,207	206,323	61.30	129,983	104,761	88,064	98,233
Port Reading	April	21	180,892	.....	235,323	17,336	8,436	229	84,031	1,367	111,399	47.30	123,924	110,706	45,071	—85,603
	4 mos.	21	859,880	.....	1,086,959	57,672	36,807	916	405,073	9,565	510,030	46.90	576,929	522,409	217,979	105,075
Pittsburgh & Shawmut	April	102	82,709	5,612	91,188	20,795	47,647	1,106	34,572	6,565	110,685	121.40	—19,497	—19,629	18,329	—42,480
	4 mos.	102	488,137	24,722	522,258	83,494	193,971	6,622	199,237	25,547	508,871	97.40	13,387	12,806	153,180	58,403
Pittsburgh & West Virginia	April	89	286,501	9,636	327,872	36,518	85,573	4,007	91,857	22,401	249,462	76.10	78,410	36,353	133,117	36,481
	4 mos.	89	996,864	35,682	1,157,494	112,592	329,705	13,515	327,574	60,916	884,423	76.40	273,071	112,051	464,790	268,855
Pittsburgh, Shawmut & Northern	April	210	107,360	6,447	116,505	30,607	38,778	1,640	48,871	6,538	126,434	108.50	—9,929	—12,561	6,438	—36,732
	4 mos.	210	501,747	33,228	546,494	96,146	174,601	7,086	233,467	24,346	535,653	98.00	10,841	937	83,335	—64,331
Quincy, Omaha & Kansas City	April	250	77,739	21,252	107,265	62,150	20,939	830	54,156	2,871	140,311	130.80	—33,046	—40,857	—46,695	—9,913
	4 mos.	250	346,945	84,768	462,453	140,137	89,142	3,398	263,774	9,550	504,519	109.10	—42,066	—60,904	—89,269	—64,399
Richmond, Fredericksb'g & Potomac	April	117	642,362	403,296	1,236,969	116,897	145,308	9,032	392,130	29,307	720,173	58.20	516,796	448,072	367,767	272,074
	4 mos.	117	1,970,086	1,541,037	4,232,292	353,587	554,291	36,403	1,540,022	116,857	2,698,087	63.80	1,534,205	1,307,015	1,029,209	732,858
Rutland	April	413	368,394	108,284	582,461	87,177	101,162	8,683	256,188	12,403	467,063	80.20	115,398	87,062	86,088	54,513
	4 mos.	413	1,310,704	472,947	2,159,783	327,753	400,353	33,519	1,041,679	50,656	1,859,802	86.10	299,981	211,183	275,083	94,223
St. Louis-San Francisco	April	4,751	5,192,504	1,496,624	7,309,429	771,422	1,447,175	92,807	2,630,464	193,969	5,084,840	69.60	2,224,589	1,830,073	1,763,089	1,258,246
	4 mos.	4,751	19,583,419	5,968,036	27,529,292	2,684,523	5,601,822	358,939	10,553,565	757,774	19,778,687	71.80	7,750,605	6,444,157	6,129,073	5,095,639
Ft. Worth & Rio Grande	April	235	70,130	25,452	105,097	27,047	24,494	3,550	62,319	5,906	123,081	117.10	—17,984	—21,759	—30,705	—36,485
	4 mos.	235	282,177	102,365	420,688	91,669	100,140	12,325	230,897	23,612	450,058	107.00	—29,370	—44,486	—79,560	—131,484
St. Louis, San Fran. & Texas	April	134	104,268	12,319	122,649	32,546	21,574	4,319	54,662	10,413	123,507	100.70	—858	—2,968	—24,101	—24,899
	4 mos.	134	399,423	54,570	478,557	106,444	85,691	15,568	217,637	33,731	458,729	95.90	19,828	11,199	—73,429	—74,024
St. Louis Southwestern	April	968	1,522,465	153,516	1,786,760	232,042	295,253	44,113	442,681	50,062	1,076,019	60.20	710,741	591,996	550,490	412,467
	4 mos.	968	6,411,538	594,375	7,343,221	811,687	1,382,395	174,878	1,941,767	212,749	4,556,304	62.00	2,786,917	2,436,171	2,120,907	1,496,046
St. Louis Southwestern of Tex.	April	807	444,326	90,714	579,638	151,084	205,892	21,313	333,520	31,920	747,777	129.00	—168,139	—195,686	—162,406	—235,121
	4 mos.	807	1,960,800	363,421	2,481,513	563,455	992,238	80,908	1,419,700	126,945	3,177,837	128.10	—696,324	—803,704	—736,228	—662,647
San Antonio & Aransas Pass	April	739	282,522	64,537	381,879	94,762	126,933	9,673	176,392	22,650	429,408	112.40	—47,529	—62,704	—55,963	—64,007
	4 mos.	739	1,188,114	246,647	1,554,192	408,801	499,187	43,650	726,406	97,261	1,770,713	113.90	—216,521	—278,922	—222,141	—302,197
San Antonio, Uvalde & Gulf	April	317	54,014	16,331	80,511	15,052	14,265	3,940	39,167	7,175	79,591	98.90	920	—2,295	—8,073	30,939
	4 mos.	317	218,231	70,410	324,820	57,727	54,065	14,666	147,760	27,733	301,689	92.90	23,131	10,413	—35,830	15,203
Seaboard Air Line	April	3,576	3,160,466	812,162	4,469,691	565,137	752,404	142,367	1,815,878	167,179	3,480,379	77.90	989,312	813,973	601,204	440,694
	4 mos.	3,575	12,922,785	3,745,393	18,386,625	2,192,287	3,227,587	595,881	7,519,247	663,992	14,373,089	78.20	4,013,536	3,310,682	2,245,630	1,130,803
Southern	April	6,971	9,036,911	2,589,961	12,558,776	1,662,556	2,326,153	222,491	4,754,467	307,473	9,356,466	74.50	3,202,310	2,614,655	2,264,178	1,537,701
	4 mos.	6,971	35,292,158	10,104,720	48,914,459	6,622,461	9,043,035	880,994	18,888,589	1,243,498	37,008,830	75.70	11,905,629	9,785,534	8,758,364	4,808,335
Alabama Great Southern	April	318	703,699	161,637	914,890	104,692	168,949	19,482	287,846	22,668	608,631	66.50	306,259	247,913	236,472	148,635
	4 mos.	318	2,779,605	598,295	3,568,141	398,807	629,074	81,029	1,208,410	98,217	2,436,614	68.30	1,131,527	913,512	933,546	538,483
Cin., N. O. & Texas Pacific	April	338	1,605,244	332,377	2,024,163	236,911	460,518	33,184	593,648	43,785	1,380,061	68.20	644,102	525,997	453,426	215,731
	4 mos.	338	6,064,468	1,334,270	7,727,474	854,868	1,705,182	135,088	2,379,044	176,521	5,293,812	68.50	2,433,662	2,021,260	1,809,314	986,741
Georgia Southern & Florida	April	402	275,561	106,971	417,452	68,028	65,937	8,876	177,391	11,004	334,552	80.10	82,900	63,862	33,278	35,195
	4 mos.	402	1,097,932	464,279	1,708,591	262,696	269,905	34,419	709,395	45,752	1,335,796	78.20	372,795	291,890	168,255	92,749
New Orleans & Northwestern	April	207	451,570	88,771	598,526	73,783	110,389	10,227	212,063	14,968	424,651	70.90	173,875	121,929	110,018	21,004
	4 mos.	207	1,798,295	312,597	2,351,258	310,668	429,109	43,128	866,513	63,738	1,726,533	73.40	624,725	416,804	382,059	92,653
Northern Alabama	April	110	126,619	12,522	142,156	22,336	4,730	2,216	50,115	4,170	83,567	58.80	58,589	49,617	29,009	15,074
	4 mos.	110	484,468	50,073	545,614	91,647	26,675	7,866	192,653	14,056	332,897	61.00	212,717	188,818	113,797	45,260

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF APRIL AND FOUR MONTHS OF CALENDAR YEAR 1923—CONTINUED

Name of road		Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	General.	Total.	Operating ratio.	Net from railway operation.	Operating income (or loss).	Net after rentals.	Net after rentals 1922.
Southern Pacific	April	7,117	$10,379,960	$3,599,121	$15,432,525	$2,131,415	$2,867,066	$288,966	$5,022,268	$430,504	$11,005,589	71.30	$4,426,936	$3,222,249	$3,074,712	$2,249,900
	4 mos.	7,116	39,024,851	14,185,348	59,052,143	8,573,771	11,245,212	1,132,206	19,646,890	1,773,934	43,422,216	73.50	15,629,927	10,574,207	10,214,356	6,167,782
Arizona Eastern	Apdil	382	247,689	29,646	289,908	46,418	48,632	2,520	77,583	16,741	192,840	66.50	97,068	72,655	59,638	86,162
	4 mos.	382	1,025,344	122,778	1,209,507	164,611	187,048	10,820	301,852	72,938	741,724	61.30	467,783	360,500	312,829	171,161
Atlantic Steamship Lines	April	....	1,045,459	60,745	1,156,705	15,240	169,991	22,118	685,605	26,323	919,277	79.50	237,428	226,548	226,548	140,849
	4 mos.	....	4,098,586	227,854	4,540,304	56,586	673,709	85,257	2,726,424	110,830	3,652,806	80.50	887,498	841,694	841,304	747,639
Galv., Harrisburg & San Antonio	April	1,379	1,295,383	406,757	1,820,298	373,974	375,994	41,956	736,889	70,218	1,586,968	87.20	233,330	173,165	149,060	53,600
	4 mos.	1,379	5,211,664	1,618,582	7,251,736	1,528,880	1,550,362	174,679	2,889,887	284,585	6,393,110	88.20	858,626	614,156	455,228	474,614
Houston & Texas Central	April	923	696,233	249,384	1,019,757	284,291	241,317	24,871	416,563	46,421	1,012,666	99.30	7,091	—47,011	—84,309	9,623
	4 mos.	923	3,005,370	990,546	4,295,919	1,012,454	979,332	102,042	1,655,135	183,647	3,925,869	91.40	370,050	153,753	8,397	598,795
Houston, East & West Texas	April	191	181,528	43,202	237,325	55,797	56,616	3,506	97,295	8,827	222,041	93.60	15,284	6,916	—3,015	14,084
	4 mos.	191	722,526	165,198	940,677	231,846	229,727	13,703	379,496	34,517	886,008	94.20	54,669	20,402	—31,587	—12,530
Louisiana Western	April	207	278,539	84,395	391,494	61,864	71,397	10,461	120,061	16,705	284,158	72.60	107,336	66,036	64,468	41,486
	4 mos.	207	1,108,297	341,877	1,557,236	257,548	288,579	38,858	452,977	67,822	1,121,095	72.00	436,141	314,247	301,044	253,524
Morgan's L. & T. R. R. & S. S. Co.	April	400	473,346	149,956	683,131	156,428	154,660	17,616	270,457	30,835	634,496	92.90	48,635	6,541	—19,395	—36,988
	4 mos.	400	2,162,210	613,414	3,011,168	665,834	626,321	66,166	1,164,122	124,728	2,651,008	88.00	360,160	176,847	60,947	—121,005
Texas & New Orleans	April	507	503,668	159,851	719,350	191,283	183,145	12,569	250,920	25,419	666,147	92.60	53,203	24,299	11,582	35,688
	4 mos.	507	2,052,894	614,458	2,871,719	775,357	696,035	53,950	1,083,827	102,018	2,719,230	94.70	152,489	37,527	—47,034	221,906
Spokane International	April	165	68,949	18,749	92,847	17,775	10,698	3,080	33,776	6,192	72,270	77.80	20,577	14,735	4,033	2,535
	4 mos.	165	323,023	66,465	410,506	51,175	41,224	12,995	156,145	23,601	288,301	70.20	122,205	98,962	67,353	45,303
Spokane, Portland & Seattle	April	554	465,128	125,411	648,283	90,986	97,739	9,165	197,507	17,228	421,869	65.10	226,414	151,393	140,579	61,720
	4 mos.	554	1,743,772	487,662	2,469,122	269,657	420,348	36,805	785,358	70,678	1,632,320	66.10	836,802	536,365	497,264	275,699
Tennessee Central	April	287	217,352	43,616	276,151	43,231	49,216	5,949	102,339	9,952	210,648	76.30	65,503	60,414	44,254	18,183
	4 mos.	287	801,881	160,166	1 015,727	145,281	170,485	23,063	397,360	38,445	774,221	26.20	241,506	220,695	138,745	34,220
Terminal R. R. Assn. of St. L.	April	37	.....	.....	429,493	99,108	40,214	988	125,548	8,470	278,115	64.80	151,378	89,809	209,652	200,146
	4 mos.	37	.....	.....	1,628,272	340,567	170,982	3,953	554,042	25,337	1,108,497	68.10	519,775	265,698	754,348	802,465
East St. Louis Connecting	April	1	.....	.....	190,018	10,072	9,269	283	58,954	2,124	80,702	42.50	109,316	98,745	77,990	13,570
	4 mos.	1	.....	.....	809,777	50,898	35,177	1,128	260,219	9,473	356,895	44.10	452,882	410,583	333,791	249,780
St. L. Merch. Bridge Term	April	9	.....	.....	408,398	37,127	29,317	913	178,158	6,483	251,998	61.70	156,400	129,623	134,810	34,818
	4 mos.	9	.....	.....	1,721,712	189,769	136,660	3,625	789,257	25,629	1,144,940	66.50	576,772	469,608	453,272	367,367
St. Louis Transfer	April	6	.....	.....	67,454	4,749	5,472	165	34,225	1,225	45,836	68.00	21,618	21,349	15,693	312
	4 mos.	6	.....	.....	290,529	17,928	21,273	656	152,503	4,943	197,303	67.90	93,226	92,143	65,849	19,723
Texas & Pacific	April	1,952	1,641,976	571,052	2,430,479	388,194	631,827	49,060	908,786	88,164	2,080,600	85.60	349,879	247,001	180,350	—4,543
	4 mos.	1,952	7,084,524	2,285,381	10,168,108	1,414,682	2,921,642	198,235	3,987,545	382,510	8,974,054	88.30	1,194,054	784,889	238,521	399,101
Toledo, Peoria & Western	April	247	82,330	39,760	135,050	29,697	48,694	2,571	71,848	7,243	160,053	118.50	—25,003	—36,003	—30,393	—15,347
	4 mos.	247	375,883	179,620	606,358	105,083	193,012	10,150	317,978	29,739	655,894	108.20	—49,536	—93,619	—70,856	—78,169
Toledo, St. Louis & Western	April	454	988,551	28,167	1,066,504	128,765	150,155	22,778	329,241	21,824	652,760	61.20	413,744	342,712	289,934	223,984
	4 mos.	454	4,061,144	113,873	4,359,236	479,108	580,793	85,478	1,355,596	72,293	2,580,265	59.20	1,778,971	1,488,047	1,248,544	702,890
Trinity & Brazos Valley	April	368	85,330	15,592	106,579	20,307	24,761	2,851	58,752	10,189	115,244	108.10	—8,665	—16,451	—29,131	—52,933
	4 mos.	368	435,016	65,547	526,275	116,008	117,263	13,535	258,098	43,768	544,534	103.50	—18,259	—48,733	—122,263	—92,653
Ulster & Delaware	April	128	88,931	15,799	139,360	18,384	17,836	1,920	66,109	7,672	111,921	80.30	27,439	21,437	15,669	12,777
	4 mos.	128	251,371	80,835	473,312	66,390	89,990	6,907	237,738	31,327	433,295	91.50	40,017	15,995	55	—23,091
Union of Penn	April	45	.....	.....	969,412	75,704	190,699	192	466,504	7,878	740,977	76.40	228,435	147,435	245,260	274,408
	4 mos.	45	.....	.....	3,584,296	227,716	737,691	702	1,874,368	30,211	2,870,632	80.10	713,664	599,664	937,687	782,580
Union Pacific	April	3,708	6,574,712	1,318,958	8,678,960	1,101,028	1,945,258	156,495	2,504,452	275,252	6,130,780	70.60	2,548,180	1,981,955	1,986,505	1,144,071
	4 mos.	3,708	25,282,434	5,010,399	33,241,758	3,204,398	7,764,784	521,026	10,198,686	1,078,365	23 370,023	70.30	9,871,735	7,612,973	7,835,761	5,947,761
Oregon Short Line	April	2,366	2,298,832	396,426	2,897,755	569,652	537,625	43,236	922,353	114,094	2,242,216	77.40	655,539	403,322	281,699	250,418
	4 mos.	2,366	9,284,705	1,546,085	11,646,782	1,680,284	2,439,781	166,600	3,905,955	426,873	8,825,728	75.80	2,821,054	1,811,662	1,679,782	1,770,523
Oregon Wash. R. R. & Nav.	April	2,238	1,541,572	411,392	2,140,330	518,351	383,908	61,326	947,929	110,519	2,040,048	95.30	100.282	—66,687	—126,306	—368,509
	4 mos.	2,237	6,326,690	1,654,385	8,754,036	1,660,550	1,757,623	232,807	4,162,805	467,346	8,360,636	95.50	393,500	—273,585	—525,943	—636,053
St. Joseph & Grand Island	April	258	230,486	24,227	271,284	44,737	41,841	2,261	106,619	12,128	207,586	76.50	63,698	50,509	36,754	9,421
	4 mos.	258	907,166	95,031	1,063,328	133,571	195,598	9,753	498,840	48,410	887,778	83.50	175,550	122,822	70,036	75,390
Utah	April	102	88,977	515	99,322	18,547	31,937	334	33,166	5,294	89,278	98.80	1,044	—4,100	—8,854	6,798
	4 mos.	102	482,129	2,684	488,696	62,252	151,536	1,393	144,639	21,274	381,304	78.00	107,392	78,105	55,363	83,819
Virginian	April	540	1,729,029	74,187	1,911,143	172,984	390,414	11,865	464,916	33,712	1,072,801	56.10	838,342	738,964	776,762	432,664
	4 mos.	540	6,430,321	284,251	7,118,487	687,006	1,533,228	45,968	1,930,363	135,338	4,338,292	60.90	2,780,195	2,365,323	2,543,504	2,129,086
Wabash	April	2,472	4,379,464	722,947	5,521,278	682,264	1,150,082	119,914	2,060,051	153,355	4,185,156	75.80	1,336,122	1,146,903	872,045	35,036
	4 mos.	2,472	16,327,144	2,679,448	20,504,288	2,524,057	4,406,719	467,174	8,227,785	599,959	16,301,875	79.50	4,202,413	3,441,415	2,330,481	1,196,832
Western Maryland	April	804	1 881,872	74,298	2,065,390	227,417	541,905	33,926	717,745	46,639	1,584,090	76.70	481,300	396,300	403,320	257,958
	4 mos.	804	6,806.052	288,586	7,513,114	781,062	1,978,043	137,507	2,759,537	178,147	5,911,959	78.70	1,601,155	1,316,155	1,460,933	1,044,911
Western Pacific	April	1,043	659,362	183,497	933,863	148,350	196,747	35,206	316,757	34,068	749,414	80.20	184,449	105,684	166,212	73,188
	4 mos.	1,043	2,674,490	550,444	3,501,405	539,291	776,655	131,248	1,367,446	134,910	2.998,838	85.60	502,567	195,997	468,044	68,331
Wheeling & Lake Erie	April	511	1,300,277	59,374	1,469.385	173,257	427,569	16,158	470,359	30,447	1,121.297	76.30	348,088	244,390	228,057	70,450
	4 mos.	511	4,304,852	234,760	4,928,004	488,449	1,621,470	59,085	1,797,314	129,059	4,107,638	83.40	820,366	419,244	323,498	502,516

(*Continued from page* 1491)

local railroad talent under the direction of T. J. Curtin and R. J. Sauer.

The head of the New Jersey Division of the aid is Mrs. C. I. Leiper, wife of the general superintendent of the railroad, New Jersey division. Her review of the work done by members of the aid during the past year is an account of varied and extensive philanthropic activities, the credit for which she ascribes to generosity and kindness throughout the membership and among all classes of employees.

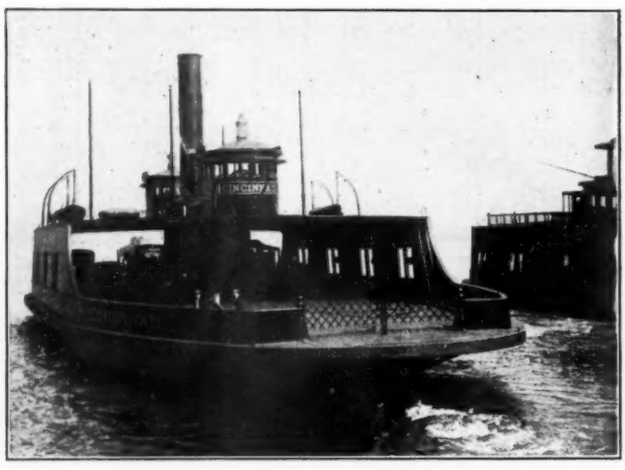
Sick employees in hospitals, distressed families of employees, and everyone connected with the road who may be in distress of any kind constitute the field of operations. The total number of families visited during the year in the New Jersey Division was 552, and aid was extended to 322 persons. Welfare work is done in all of the usual lines and large numbers of new garments were made. Thirty-four mohair coats were repaired for the ticket sellers in the Pennsylvania station, New York. Chief credit for good management is given to the purchasing committee, the work room and visiting committees.

Social activities of various kinds have been promoted and the number of tickets sold to the annual entertainment last year was 17,135. Meetings are held in New York City every month. A report of cases assisted by the women of the New Jersey Division in a single month, March, contains 80 items, ranging from gifts of flowers or cash to complete support of a family for a limited period.

P. R. R. Ferryboat Exclusively for Vehicles

The Pennsylvania has placed in service in New York Harbor a ferry boat for the handling of vehicular traffic exclusively between New York and Jersey City. Since the inauguration of the Hudson & Manhattan tube service between New Jersey and New York in 1909, the ferry passenger traffic of the Pennsylvania has been decreasing. At the same time the general adoption of the automobile for trucking and pleasure purposes has increased to such an extent that vehicular travel to New Jersey via the Pennsylvania ferries has more than doubled in the past ten years.

In view of this changed condition, and to provide prompt and adequate ferry transportation for vehicular traffic, and eliminate



P. R. R. Ferryboat for Vehicles Only

team congestion in the streets of Jersey City and New York City, the Pennsylvania Railroad has gradually converted its entire ferryboat fleet, consisting of eight boats, into what is termed "double team gangway boats," on which the lower deck is reserved for vehicles, and the upper deck for passengers. By reconstructing the ferryboats in this fashion, their vehicular carrying capacity has been doubled, so that now as many as sixty pleasure automobiles can be accommodated on each trip across the river.

"The Cincinnati," which was put into service on June 6, is the last of the ferryboat fleet to undergo conversion. It will be used primarily to facilitate the movement of the peak travel in the morning and evening on weekdays and all day on Sundays and holidays.

Traffic News

The Philadelphia & Reading announces the resumption of hourly express trains throughout the day between New York and Philadelphia, restoring the service which was in effect before the war. Trains leave New York, Eastern Time, every hour from 6 a. m. to 6 p. m. and leave Philadelphia every hour from 6 a. m. to 5 p. m. This is an increase of three trains each way.

The New York Central reports that during the month of May the number of carloads of automobiles shipped from stations on its lines was 21,224, or an average of 817 carloads a day. A large proportion of all the large automobile manufacturing centers are located on New York Central lines. In January the number of carloads shipped from New York Central stations was 16,250; February, 16,375; March, 19,904; April, 20,807.

An experimental air freight service is announced to be established between Detroit and Cleveland on July 1 by the Detroit Board of Commerce. The equipment will consist of three all-metal monoplanes equipped with pontoons, which will make four trips daily across the lake. Each plane will have a carrying capacity of 1,500 lb. of freight and will be able to fly at the rate of 135 miles an hour. The air line distance between the two cities is 90 miles and it is planned to cover the trip in less than one hour.

The coal carrying capacity of the Pennsylvania Railroad has, in the last few months, been increased by what is equivalent to the addition of 2,308 new coal cars; this by substituting 70-ton trucks for 50-ton trucks under 10,188 cars. To date 6,173 cars have been turned out of the Altoona shops with this work completed, their carrying capacity being increased 31 per cent each. When these cars were built, 70-ton capacity bodies were placed on 50-ton trucks and the load restricted to 50 tons, because of insufficient strength of certain bridges on branch freight lines to carry the heavier loads.

District Manager of Car Service Division, New York

E. J. Cleave, formerly connected with the Pennsylvania Railroad, has been appointed district manager of the Car Service Division of the American Railway Association in New York, with headquarters at 30 Vesey street. District headquarters have already been established in Minneapolis, Birmingham, Dallas, St. Louis, Chicago, Cincinnati and Toledo. The New York district includes New York City, practically all of New York State, the entire states of New Jersey and Delaware, the eastern shore of Maryland and Virginia and the eastern half of Pennsylvania.

Great Northern Plans for Gibbons-Dempsey Fight

The Great Northern has formulated plans by which it will handle the heavy passenger traffic to the Gibbons-Dempsey fight at Shelby, Mont., on July 4. It is expected that 30,000 people will travel to Shelby, which is the junction of the Great Northern's main transcontinental line with the Burlington's connection from Kansas City and St. Louis by way of Billings, Mont. A branch also extends north from Shelby to a connection with the Canadian Pacific at the International Border.

Shelby has permanent trackage sufficient for parking about 200 passenger cars and materials are being assembled sufficient to enlarge this to take care of 40 special trains of sleeping cars. Temporary platforms and stations will be provided for the special trains. It is planned to erect one station for all trains from the east, another for trains from the west and a third for trains from the south.

In addition to providing all necessary requirements for the parking of special trains, the road is making provision for housing and feeding the railway employees at Shelby and in conjunction with the Western Union Telegraph Company, for handling press reports.

Two trains will leave Chicago at 10 a. m. on July 1, one of which will run to Shelby and return directly to Chicago, arriving on July 6, while the other will run to Shelby and then to Glacier Park, arriving in Chicago on July 10.

Equipment and Supplies

Locomotives

THE NORFOLK & WESTERN is inquiring for 10 locomotive tenders.

THE SEWELL VALLEY is inquiring for one Mikado type locomotive.

CENTRAL EST PALMA has ordered one locomotive from the American Locomotive Company.

THE RED RIVER & GULF has ordered one 4-6-0 type locomotive from the Baldwin Locomotive Works.

THE CHAMPION FIBRE COMPANY has ordered one 42-ton, two truck Shay locomotive from the Lima Locomotive Works.

THE MERIDIAN LUMBER COMPANY, Meridian, La., has ordered one Consolidation type locomotive from the Baldwin Locomotive Works.

THE FERROCARRIL DE ANTIOQUIA, Columbia, has ordered two Consolidation type locomotives from the American Locomotive Company.

THE ATLANTIC FRUIT COMPANY OF CENTRAL TANAMO, Cuba, has ordered two Consolidation type locomotives from the Baldwin Locomotive Works.

Freight Cars

THE UNION RAILROAD is inquiring for 50 flat car bodies of 70 tons' capacity.

THE CANADIAN NATIONAL is asking for prices on the repair of 2,500 box cars.

NASH, WATJEN & BANGS, LTD., 2 Rector street, New York City, are inquiring for 2 tank cars for export.

COSDEN & CO., New York, are inquiring for two tank cars of 10,000 gal. capacity and three of 8,000 gal. capacity.

The New York, New Haven & Hartford is inquiring for prices on the repair of from 500 to 1,000 steel underframe box cars.

Iron and Steel

THE CHICAGO, BURLINGTON & QUINCY is inquiring for 1,000 tons of structural steel.

THE LOUISVILLE & NASHVILLE is inquiring for 150 tons of structural steel for bridge work.

Passenger Cars

THE CHICAGO & EASTERN ILLINOIS has ordered two dining cars from the Pullman Company.

Machinery and Tools

THE PENNSYLVANIA is inquiring for 12 machine tools of various kinds.

THE MISSOURI PACIFIC has placed an order for a 2,500-lb. hammer.

THE PERE MARQUETTE is inquiring for 79 machine tools of various kinds.

THE AKRON, CANTON & YOUNGSTOWN is inquiring for seven machine tools.

THE NORFOLK & WESTERN has placed an order for two 150-ton overhead cranes.

THE NEW YORK, CHICAGO & ST. LOUIS is inquiring for 13 machine tools of various kinds.

THE CHICAGO, BURLINGTON & QUINCY is inquiring for 61 machine tools of various kinds.

THE CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS is inquiring for three 30-ton locomotive cranes.

THE SOUTHERN PACIFIC has ordered one 25-ton electric gantry crane with a 45-ft. span from the Whiting Corporation.

THE NEW YORK CENTRAL has ordered five 20-ton locomotive cranes from the Brown Hoisting Machinery Company.

THE PERE MARQUETTE has ordered one three-motor five-ton electric traveling bucket crane of 50 ft. span for cinder and coal handling from the Northern Engineering Works.

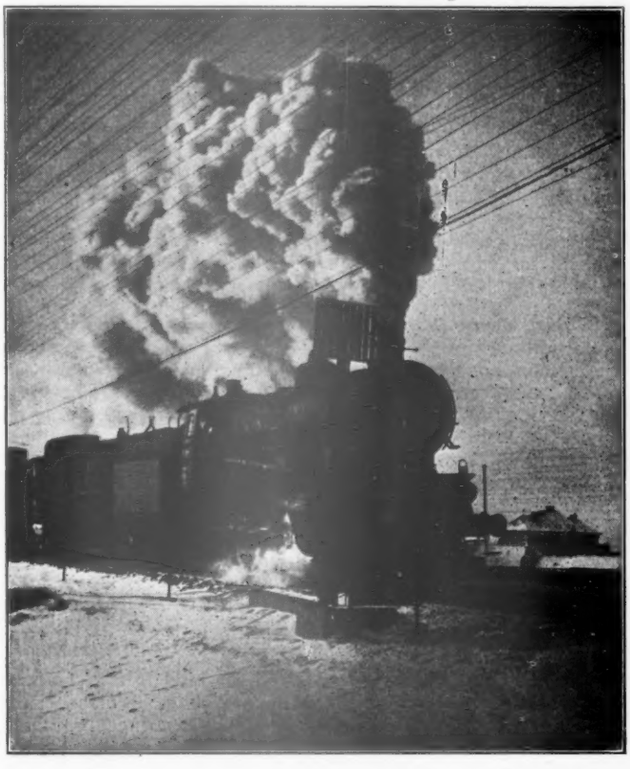
THE CHICAGO, BURLINGTON & QUINCY has ordered 54 small capacity jib cranes with trolleys and miscellaneous material for its shops at Denver, Colo., from H. D. Conkey & Company.

THE LEHIGH VALLEY is inquiring for machine shop tools including a guide grinder, horizontal spindle locomotive rod milling machine, vertical rod milling machine, locomotive driving box boring and facing machine, also for an engine lathe.

Signaling

THE CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS has ordered from the Union Switch & Signal Company an electro-mechanical interlocking for Green Spring Junction, Ohio; 32 working mechanical levers and seven "S-8" electric units.

THE PENNSYLVANIA is to install a Style "S-8" electro-mechanical interlocking at West Rochester, Pa.; eight working mechanical levers and five electric levers. A machine of this type will also be installed at Warren, Ohio, 36 mechanical levers and 19 electric. This road is also installing an electro-pneumatic interlocking at Canton, Ohio, with 17 working levers. All of these materials are being furnished by the Union Switch & Signal Company.



A Ten-Wheel Locomotive on an Express Train, Southern Railway, Jugo-Slavia

Supply Trade News

L. M. Dalton has been appointed manager of the Boston office of the **Link Belt Company,** succeeding E. J. Burnell, resigned.

The Hisey Wolf Machine Company, Cincinnati, Ohio, has appointed **R. L. Barker & Company,** Chicago, as its exclusive representative in Indiana, Illinois, Wisconsin and Iowa.

The name of the Electric Steel Company, Chicago, has been changed to the **Nugent Steel Castings Company.** There is no change in management, ownership or personnel.

Gibbs & Hill, consulting engineers, with offices in the Pennsylvania Station, New York City, have been retained by the Virginian Railway in connection with the electrification of that road.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., will give all its employees an opportunity to participate in the purchase of a new issue of 20,000 shares of common stock, to be paid for on the deferred plan at $53 a share (par value $50). Each employee may subscribe for one to twenty shares of stock and pay for it in ten consecutive monthly instalments.

D. B. Stokes, formerly Western sales manager of the **United States Cast Iron Pipe and Foundry Company,** has been appointed general sales manager with headquarters in the Morris building, Philadelphia. **W. G. Savage,** formerly eastern sales manager, has been appointed Western sales manager with headquarters in the Peoples Gas Building, Chicago. **C. E. Braun** has been appointed assistant Western sales manager with headquarters in Chicago.

The Amsler-Morton Company, Pittsburgh, Pa., and 2039 Railway Exchange building, St. Louis, Mo., has been appointed agent of the **Uehling Instrument Company,** Paterson, N. J., for eastern Missouri and southern Illinois. **H. R. N. Johnson,** who formerly represented the Uehling Instrument Company has joined the **W. P. Nevins Company,** 120 South Ninth street, Minneapolis, Minn., which company is now the Uehling representative in Minnesota and the Dakotas.

W. W. Martin, of the general offices of the **Westinghouse Air Brake Company,** Wilmerding, Pa., has been elected an assistant auditor. Mr. Martin has been connected with the auditing department since 1906 and was chief clerk prior to his recent promotion. **P. B. McGinnis** has been appointed representative, with headquarters in Chicago, where he previously served as mechanical expert and **H. R. Hood,** of the Wilmerding office, succeeds him as mechanical expert.

S. Bert Bennett, who was formerly assistant road foreman of locomotives of the Lehigh Valley, and **Alex. D. Lawrence,** engineman on the Boston & Albany, have been appointed service engineers of the **Franklin Railway Supply Company, Inc.,** New York. **William A. Bradshaw,** formerly in the motive power department of the Central of New Jersey, has been appointed an inspector, and **G. R. Grove,** formerly with Hunt & Company as inspector of new locomotives, is now mechanical inspector for the Franklin Railway Supply Company.

The Electric Storage Battery Company, Philadelphia, Pa., has organized two separate departments within the railway sales division to handle the car lighting and signal, and car control battery business of the company, respectively. **Wm. H. Palmer, Jr.,** was made manager of the railway sales division with headquarters at Philadelphia to fill the vacancy caused by the resignation of Harry B. Marshall, who left the company to engage in private business. Mr. Palmer has been associated with the Electric Storage Battery Company since August 1, 1894, with the exception of a few years, when he served with other interests closely identified with the storage battery industry. **Thomas L. Mount** has been appointed manager of the car lighting department and **H. B. Crantford,** manager of the railway signal department with headquarters at Philadelphia; both will serve under Mr. Palmer, the manager of railway sales division. Mr. Mount has been associated with the development of railway car lighting by electricity for the past 18 years. He was employed by the Consolidated Railway Electric Lighting & Equipment Company, successively as draftsman, machinist, foreman and on the road installing, maintaining and operating some of the first axle lighting equipments using the Manchester type of Exide batteries. Later he became a member of the sales staff and eventually vice-president of the Consolidated Railway Electric Lighting & Equipment Company, in charge of sales and engineering. In 1919 he entered the service of the engineering department of the Electric Storage Battery Company, and later was transferred to the railway division in connection with car lighting equipment sales. Mr. Crantford has been in the railway sales department from 1919 until 1923 at Chicago. Prior to that he was engaged in automatic signal and interlocking installation and maintenance for the General Railway Signal Company. He served as signal maintainer and foreman on the Northern Pacific and on the Chicago, Milwaukee & St. Paul. He also served as supervisor of signals, telegraph and telephone for the electrified zone of the latter company.

The Midvale Company

The recently organized Midvale Company, successor to the historic Midvale Steel Company, reports that it is operating its various departments on a fair schedule in the production of forgings, tires, large and small rings, roll shells, large crank shafts, hardened and ground rolls, special designs of extrusion cylinders and liners, piston and hammer rods, and forged members to withstand shock and fatigue. It is also producing, as a special product, large quantities of iron and steel castings, rough and machined, for nearby industries. There is an active increase in its business of carbon and high speed tool steels, and its purpose is to expand its tool steel output in the near future to include all analyses and sizes.

In charge of the plant is Dr. H. L. Frevert, who started with Midvale about 15 years ago, after graduating from Harvard University. In addition to the other departments, the Midvale Company continues to conduct its research work under the supervision of Dr. Frevert and John Lyman Cox.

The Midvale plant in addition to the steel works, forge and hammer shops, and rolling mills, has eight large machine shops. These include one tire machine shop, a slicing shop, two roughing shops and four shops for general finished machined work. In addition to previously mentioned units, the Midvale Company has iron, steel and brass foundries. These foundries are utilized principally for the production of large castings to go along with forgings.

The following officers of the company have been elected: Alva C. Dinkey, president; Dr. Harry L. Frevert, vice-president; James M. Milliken, secretary and treasurer; Stuart Hazlewood, vice-president in charge of sales.

Obituary

W. A. McWhorter, general manager of the Bradford Draft Gear Company, New York, died at his home in Chicago on June 9, after an illness of two days. Prior to his connection with the Bradford Draft Gear Company, Mr. McWhorter was located in the South, as assistant master mechanic of the Georgia Railway & Power Company, superintendent of equipment of the Birmingham Railway, Light & Power Company, and in the sales department of the Galena Signal Oil Company, with headquarters at Atlanta, Ga. He left the last named company in 1916, to take up work with the Bradford Draft Gear Company.

Trade Publications

GASOLINE MOTOR COACHES.—A folder has recently been issued by the Service Motors, Inc., Wabash, Ind., in which are illustrated a number of its model 55 motor coaches as they have been built for a number of steam railways. In addition to the specifications of the model 55 coach, it gives considerable data as to the cost of operating this equipment, which has been obtained from a number of users.

Railway Construction

CHICAGO & ALTON.—This company plans the construction of a new roundhouse and complete terminal facilities at Ridgeley, Ill. Bids for the work are expected to be called for in the near future.

CHICAGO & EASTERN ILLINOIS.—This company plans the construction of new locomotive and car shops at Terre Haute, Ind., and has purchased land for the site of the buildings. Plans for the initial buildings are now being made.

CHICAGO, ROCK ISLAND & PACIFIC.—This company contemplates the construction of an addition to its engine house and shops at Caldwell, Kan., to cost approximately $40,000.

COLUMBUS BELT.—This company will construct a 12-mile belt railroad around the city of Columbus, Ohio, starting six miles west of the Union station and circling the city to the south and east. The company is now applying for a charter and the work of construction will begin soon after the necessary legal steps are taken. The project is estimated to cost approximately $12,000,000. John E. Bleekman, 1105 Atlas building, Columbus, Ohio, is president of the company.

DENVER & RIO GRANDE WESTERN.—This company will construct a coaling station at Green River, Utah, and a water treating plant at Goshen, Utah. A new engine house will also be constructed at Green River. A new passenger station will be constructed at Ignatio, Colo., to replace one destroyed by fire.

LAWERINO COMPANY.—Channing M. Ward, of Richmond, Va., on behalf of this company, has applied to the Interstate Commerce Commission for a certificate authorizing the operation of steamboat, ferry and barge lines on the Potomac river and the construction and operation of a railroad from Persimmon point and Lyell's and Warsaw, Va., about 40 miles.

MISSOURI PACIFIC.—This company has awarded a contract to the Folwell-Ahlskog Construction Company, Chicago, for the construction of a one-story, reinforced concrete track shed at St. Louis, Mo., to cost approximately $100,000. Another contract has been awarded to the same construction company for the erection of a one-story, concrete boiler house adjacent to the new grain elevator at St. Louis.

NATIONAL RAILWAYS OF MEXICO.—This company plans the construction of a branch line from Mexicali, Lower California, to the Gulf of California. Surveys have been completed and bids are expected to be asked for in the near future.

NEW MEXICO CENTRAL.—This company has applied to the Interstate Commerce Commission for a certificate authorizing an extension of its line from Santa Fe to Gallina, N. M., 100 miles.

NEW YORK, CHICAGO & ST. LOUIS.—This company will construct a passing and interchange track east of Fostoria, Ohio, and will construct 5 miles of second track from Fostoria to Arcadia, Ohio. This company will also construct 11 miles of second track from Lorain, Ohio, to Vermilion. Other improvements planned by the company include the elimination of grade crossings on the west side at Cleveland, Ohio, at a cost of $200,000; construction of a reservoir and pumping station at Tipton, Ind., and track elevation at Indianapolis, Ind.

OREGON SHORT LINE.—This company has applied to the Interstate Commerce Commission for a certificate authorizing the construction of an extension from Nampa, Idaho, to a point on its Boise branch, 2.5 miles.

OREGON-WASHINGTON.—This company has been ordered by the Public Service Commission of Oregon to construct a 240-ft. viaduct over its tracks at Oro Dell, Ore., to cost approximately $57,000.

PENNSYLVANIA.—This company will begin at once a program of improving and enlarging existing facilities in the Northwestern region at a cost of over $2,000,000. The tracks at Fifty-fifth street, Chicago, will be elevated at a cost of $616,000 and additional tracks will be laid in the Fifty-ninth street yard. Additions to the shops at Fifty-ninth street will cost $121,000, and a new team track and driveway facilities will be constructed at Sixty-third street. The slip at the coal docks at Sandusky, Ohio, will be deepened at a cost of $301,000. Second track will be constructed from Webb, Ohio, to Walbridge, with a 125-car siding at Webb, to cost $400,000. Other improvements which have been authorized include the extension of sidings at Lima, Ohio, to cost $23,000; extension of tracks at Crestline, Ohio, at a cost of $399,000; additional tracks at Mansfield, Ohio, to cost $73,000 and a 110-ft. turntable at Ft. Wayne, Ind.

PERE MARQUETTE.—This company has awarded a contract to M. Babbitt & Sons, Toledo, Ohio, for the construction of the terminal facilities at Erie, Mich., reported in the *Railway Age* of May 12.

PHILADELPHIA & READING.—Work on the new $3,000,000 Camden (N. J.) Terminal of this company's seashore lines is being pushed rapidly. When it is completed it will provide extensive additions to the company's ferry and track facilities necessary for the proper handling of its growing seashore traffic. Practically all of the extensive fill-in required has been completed. Work has also been finished on the laying of the foundations for the ferry slips. Workmen are now putting in the foundations for the building and are grading the yard and laying the tracks. The contract has been awarded for the interlocking and bids for the signal tower have been asked for. It is expected that the erection of the steel work will begin about July 15. The plans for the new terminal call for a two-story structure of steel frame and brick with stone trimmings on a concrete foundation built on piles. It will house the electrically operated ferry slips, the train shed containing 14 tracks, a concourse 328 feet long and 105 feet wide, waiting rooms for men and women, a restaurant, and the offices of the Delaware River Ferry Company and of the seashore lines of the Philadelphia & Reading Railway.

ST. LOUIS-SAN FRANCISCO.—This company will construct a new passenger station, 45 ft. by 275 ft., at Springfield, Mo. The building will be in California mission style and will cost approximately $125,000.

ST. LOUIS-SAN FRANCISCO.—This company closed bids on June 6 for the erection of new shop buildings on Tyler avenue, St. Louis, Mo., which include a 20-stall roundhouse, machine shop, car plant and two wash-rooms. The improvement is estimated to cost $500,000. This company has awarded a contract to John M. Olsen, of Springfield, Mo., for the construction of shop buildings at East Thomas, Ala., reported in the *Railway Age* of March 10. This company has also awarded a contract to the E. G. Fike Company, Tulsa, Okla., for the installation of eight culverts on the Southwestern division and to the J. W. McMurray Construction Company, Kansas City, Mo., for 19 culverts on the Southern division and eight culverts on the River division.

SOUTHERN.—This company will construct a brick and concrete addition to its passenger station at Chattanooga, Tenn., at a cost of approximately $30,000.

TOLEDO TERMINAL.—This company has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a cinder handling plant at Toledo, Ohio.

UNION PACIFIC.—This company has completed plans, involving an expenditure of $300,000, for the laying out of an industrial site in Denver, Colo., adjacent to its tracks. The district will be 3,125 ft. long and 1,000 ft. wide. After the ground is cleared, streets will be laid out and the area divided into factory sites.

UNION PACIFIC.—This company will construct approximately three miles of yard tracks at North Topeka, Kan.

UNION PACIFIC.—This company will construct a new six-stall roundhouse at Topeka, Kan. This company also plans the construction of a new machine shop at Topeka.

WESTERN PACIFIC.—This company will construct addtions to its car and locomotive shops at Sacramento, Cal., at a cost of approximately $225,000.

The Nickel Plate's Improvement Program for 1923

Initial expenditures for new equipment and improvements for the New York, Chicago & St. Louis will amount to $11,382,500, it has been announced by J. J. Bernet, president.

Amounts already budgeted for 1923 are $6,066,000 to cover such improvements as highway crossing protection, additional trackage, yard and storage facilities, etc., and $5,316,550 for new equipment, the latter embracing $1,132,500 allotted for the purchase of gondola cars; $1,975,000 for hopper cars; $1,920,000 for freight locomotives; and $289,050 for passenger locomotives.

The new equipment is scheduled for delivery during July, August and September and will be in operation next fall when the traffic movement is expected to exceed all previous records. In addition to the equipment provided for in the 1923 budget the road has already placed in service 500 of the 1,000 automobile cars ordered in 1922. The automobile cars were ordered in expectation of an extraordinary activity in automobile output which materialized in April when all records in the automobile field were surpassed, the output in that month being 365,000 cars and trucks as against 353,000 in March.

Included in the plans are provisions to facilitate traffic interchange between the Nickel Plate and the Hocking Valley. The Hocking Valley and the Nickel Plate intersect at Fostoria, Ohio, from which point a large volume of C. & O. coal will be routed east over the Nickel Plate to Cleveland and Buffalo and west to Chicago and other places. Plans call for a passing siding and interchange track east of the Fostoria connection and the development and double track right of way from Fostoria to Arcadia, Ohio, through a combination of the Nickel Plate and Lake Erie & Western main tracks.

The three constituent roads of the consolidated Nickel Plate will share in the 1923 budget. The program calls for extensive betterments on the main Nickel Plate division and the Lake Erie & Western and Clover Leaf divisions. Thirty-two miles of second track will be laid and new and heavier tracks placed at various points in order to accommodate the Pacific and Mikado locomotives which are included in the new equipment ordered.

Other improvements provided for are the completion of the work of grade-crossing elimination on the West Side, Cleveland, at a cost, this year, of about $200,000, second-tracking from Fort Wayne to Hadley, Ind., and from Lorain, Ohio, to a point near Vermilion, Ohio; additional yard trackage at Painesville, Ohio, and Fort Wayne, Ind.; highway viaduct improvements and building improvements at Lima, Ohio; reservoir and pumping station and building improvements at Tipton, Ind., and track elevation at Indianapolis.

Fremont, Ohio, Michigan City and Muncie, Ind., and many other towns are listed for bridge renewals. Miscellaneous items, including improvements for shop and round houses and the purchase of machine tools and shop materials are listed for Buffalo, N. Y.; Conneaut, Ohio; Bellevue, Ohio; Fort Wayne, Ind.; Stony Island, and other places.

The budget provides for complete, though gradual, rejuvenation of the Lake Erie & Western and the Clover Leaf and their development as intensive carriers like the original Nickel Plate which has long been celebrated for the density of its traffic movement. The new locomotives of the Pacific and Mikado types have necessitated boosters, automatic stokers, heavier rails, enlarged round-house and terminal facilities and reinforced bridge and culvert work at various points along the western part of the system.

THE YOUNG MAN (or woman) who graduates from a four-year period devoted mainly to study should aspire and aim to become a leading citizen as early as practicable. Having in mind this consideration, the passenger department of the Lehigh Valley, in its farewell message to the 900 students of Cornell University who for four years have been frequent patrons of the railroad and who now are scattering to all parts of the country adds, as a footnote, the following:

"As citizens you will wield an unusual influence. Will you not, in exercising this, do what you can toward preventing the imposition upon the railroads of restrictive legislation and regulation? This is necessary if this basic industry is to be administered along sound business lines, and the American public furnished the best possible transportation service at the lowest rates consistent with a fair return on the capital invested."

Railway Financial News

BALTIMORE & OHIO.—*Six Months Guaranty Certified.*—The Interstate Commerce Commission has issued a final certificate stating the amount of this company's guaranty for the six months of 1920 following the period of federal control as $26,072,416, of which $5,672,416 was to be paid in final settlement after several partial payments.

CHICAGO & EASTERN ILLINOIS.—*Annual Report.*—The annual report for the year ended December 31, 1922 shows a net income of $787,344 as compared with $2,116,713 in 1921. A selection of the principal items in the income account follows:

	1922	1921	Increase or Decrease
Average mileage operated	945	1,131	— 186
Freight revenue	$18,257,138	$20,282,431	— $2,025,293
Passenger revenue	4,580,655	5,051,669	— 471,013
Total railway operating revenue.	24,731,348	27,099,146	— 2,367,798
Maintenance of way and structures	2,782,201	2,772,461	9,740
Maintenance of equipment	6,567,570	8,572,405	— 2,004,835
Traffic	508,835	441,522	67,314
Transportation—rail line	10,354,312	11,163,435	— 809,123
General	792,109	838,654	— 46,546
Total railway operating expenses.	21,134,733	23,944,405	— 2,809,671
Net revenue from railway operations	3,596,615	3,154,741	441,873
Railway tax accruals	1,155,000	1,210,000	— 55,000
Railway operating income	2,435,876	1,938,681	497,195
Net railway operating income	2,721,469	2,153,582	567,887
Miscellaneous income	393,789	780,295	— 386,507
Gross income	3,115,258	2,933,878	181,380
Total deductions	2,327,914	817,165	1,510,749
Net income	787,344	2,116,713	— 1,329,369
Income applied to sinking and other reserve funds	184,668	.....	184,668
Balance of income	602,676	2,116,713	— 1,514,036

CLEVELAND UNION TERMINALS COMPANY.—*Bond Issue Authorized.*—The Interstate Commerce Commission has authorized an issue of $15,000,000 of 5 per cent first mortgage bonds to be sold at not less than 90. The bonds are to be guaranteed by the New York Central, New York, Chicago & St. Louis, and the Cleveland, Cincinnati, Chicago & St. Louis.

COLORADO & SOUTHERN.—*Annual Report.*—This company's annual report for 1922 is reviewed in an article on another page of this issue entitled "The Colorado & Southern an Exception in Colorado." See also excerpts from annual report on adjacent page.

DULUTH & IRON RANGE.—*Annual Report.*—The annual report for the year ended December 31, 1922 shows a net income of $1,505,183 as compared with $144,676 in 1921. A selection of the principal items in the income account follows:

	1922	1921	Increase or Decrease
Railway operating revenues	$6,818,657	$4,972,513	$1,846,144
Railway operating expenses	4,648,861	4,369,544	279,318
Net revenue from railway operations	2,169,795	602,969	1,566,826
Railway tax accruals	518,524	298,852	219,672
Total operating income	1,650,869	303,788	1,347,081
Gross income	2,130,850	679,985	1,450,865
Total deductions	625,667	535,309	90,358
Balance of net income	1,505,183	144,676	1,360,507

DULUTH, MISSABE & NORTHERN.—*Annual Report.*—The annual report for the year ended December 31, 1922, shows a net income of $6,072,300 as compared with $2,746,419 in 1921. A selection of the principal items in the income account follows:

	1922	1921	Increase or Decrease
Railway operating revenues	$14,976,811	$12,374,949	$2,601,863
Railway operating expenses	7,551,484	7,311,611	239,873
Net revenue from railway operations	7,425,328	5,063,338	2,361,990
Railway tax accruals	876,698	1,380,761	504,063
Total operating income	6,548,598	3,682,576	2,866,022
Gross income	7,078,383	4,084,668	2,993,716
Total deductions	1,006,083	1,338,249	332,165
Balance of net income for the year	6,072,300	2,746,419	3,325,881

GEORGIA & FLORIDA.—*Tentative Valuation Issued.*—The Interstate Commerce Commission has issued a tentative valuation of this company's property as of June 30, 1918, which states the final value of the property owned as $4,618,813 and of the property used as $4,815,313. The capitalization of the company as of the valuation date was $17,087,455, and its investment in road and equipment, $15,591,730.

INDIANA HARBOR BELT.—*Equipment Trust Certificates Authorized.*—This company has been authorized by the Interstate Commerce Commission to assume obligation and liability in respect of $900,000 of equipment trust certificates to be sold at not less than 95.

KEOKUK & DES MOINES.—*Bondholders' Committee.*—An announcement dated June 4, 1923, states that a committee for the protection of the interests of holders of the five per cent first mortgage bonds, due October 1, 1923, has been in existence for some time. Its present members include F. J. Lisman (chairman), F. J. Lisman & Co., New York; Frank W. Matteson, Providence; Samuel Sloan, vice-president, The Farmers' Loan and Trust Company; Reginald B. Lanier, Winslow, Lanier & Co., New York. The members of the committee represent large holdings of the bonds. The committee will watch the bondholders' interests and, when advisable, will call for the deposit of bonds.

LEHIGH VALLEY.—*Asks Authority to Issue Bonds.*—This company has applied to the Interstate Commerce Commission for authority to issue $6,000,000 of general consolidated mortgage bonds to reimburse the treasury for expenditures from current funds in paying a like amount of Easton & Amboy bonds which matured May 1, 1922. It is not now proposed to sell the bonds.

New Director.—Alfred H. Swayne, vice-president of the General Motors Corporation, has been elected a director to succeed Charles D. Norton, deceased.

LITTLE ROCK, MAUMELLE & WESTERN.—*Judgment for Bondholders.*—The Union Trust Company of Little Rock, Ark., as agent for the bondholders of this company, has been granted a judgment against the road for $212,000 and interest, representing overdue and unpaid bonds of the company. The road extending from Little Rock to Windham, about 40 miles, discontinued operation in 1922. The decree authorizes the sale of all property of the road which has not previously been disposed of by the receiver under authority of the court.

LOS ANGELES JUNCTION.—*Organization.*—The Los Angeles Junction Railway Company has been incorporated in Los Angeles, Cal., with J. A. Spoor, Chicago, chairman of the board; R. Fitzgerald, Chicago, president; H. E. Poronto, Chicago, vice-president and J. A. McNaughton, Los Angeles, vice-president. The company will serve the Union Stockyards and other industries in the central manufacturing district of Los Angeles. Trackage has been obtained on the Southern Pacific, the Atchison, Topeka & Santa Fe and the Los Angeles & Salt Lake. The Junction is expected to be in operation by the end of the year and will be modeled on the order of similar terminals in Chicago.

MARYLAND, DELAWARE & VIRGINIA.—*Sale Ratified.*—The sale of this company's rail line and steamers to three separate interests was ratified on June 7 by Judge Morris A. Soper, in the United States District Court at Baltimore, Md. Judge Soper signed an order appointing Edward Guest Gibson, of Baltimore, special commissioner to finish the details of the transaction. Mr. Gibson was ordered to prepare a statement and account of the proceedings and request creditors of the railway to file statements of their claims. Under the court ruling all such claims are to be in the hands of the clerk of the District Court before October 8.

NEW YORK CENTRAL.—*Equipment Trust Certificates Authorized.*—The Interstate Commerce Commission has authorized this company and its subsidiaries to assume obligation and liability in respect of $17,340,000 of equipment trust certificates to be sold at not less than 95.

NEW YORK CENTRAL.—*Dividend Rate 7 Per Cent.*—The directors on Wednesday declared a quarterly dividend of 1¾ per cent, raising the annual rate from 5 to 7 per cent. The quarterly dividend is payable on August 1 to stockholders of record on June 29. The company paid 5 per cent annually from 1915 to 1922.

The announcement had an immediate effect on the market. The stock was bid up rapidly to 104, as compared with Tuesday's closing of 100. The convertible 6 per cent debentures also showed a sharp rise, going to 106¼.

The following statement was issued after the meeting of the board of directors:

For years the company has paid upon its stock dividends of 5 per cent, even at times when that was less than the current interest on borrowed money. Income from the above dividends has been added to the surplus and put back into the property, so that since the New York Central-Lake Shore consolidation in 1914, the surplus has increased from $29,405,934 to $112,581,292.

A large part of the company's capital is in long term bonds bearing low rates of interest, the rate on the funded debt averaging 4.40 per cent per annum. The interest on the funded debt, plus dividends at the rate of 7 per cent, makes the return paid upon capital—par of debt and stock together—5.07 per cent and this without allowing for any return on the reinvested surplus. The New York Central now owns 95 per cent of the stock of the Michigan Central and 90 per cent of the stock of the C. C. C. and St. L. These companies are doing a large business and their increased net income inure to benefit of their stockholders.

The lines of the New York Central and controlled companies are located in a productive territory. They are well equipped and they are performing a great public service in transportation. In order to provide the enlarged facilities required to keep pace with the growth of business it is necessary, from time to time, to secure additional capital. Such additional capital should come partly at least from the sale of additional stock. The stock of the company, as well as its bonds, must be made attractive to investors because future financing cannot with advantage be on the basis of a constantly increasing debt and a stationary amount of stock.

Because of the low capital of the New York Central, the low interest rate on its funded debt, the great value of its properties and the present and prospective earnings, the directors feel that an increase should be made in the dividend rate paid to stockholders.

RUTLAND.—*Annual Report.*—The annual report for the year ended December 31, 1922, issued this week, shows a surplus for the year of $153,036 as compared with $13,327 for the previous year. A selection of the principal items in the income account follows:

	1922	1921	Increase or Decrease
Freight revenue	$3,167,577	$3,232,699	— $65,122
Passenger revenue	1,477,880	1,554,941	— 77,061
Total operating revenues	5,803,158	5,811,556	— 7,398
Maintenance of way and structures	1,088,292	1,279,452	— 191,160
Maintenance of equipment	1,116,251	988,502	127,748
Traffic	100,336	104,153	— 3,817
Transportation	2,610,526	2,639,342	— 28,816
General	160,799	170,636	— 9,838
Total operating expenses	5,094,821	5,203,707	— 108,886
Net revenue from railway operations	708,337	607,848	100,488
Railway tax accruals	262,776	298,829	— 36,053
Total operating income	445,492	308,913	136,580
Net railway operating income	530,433	450,911	79,522
Total non-operating income	74,130	135,217	— 61,087
Gross income	604,562	586,128	18,435
Total deductions from gross income	451,526	572,801	— 121,275
Surplus for the year	153,036	13,326	139,710

Railroad Administration Settlements

Payments to the following railroads in settlement of accounts for the period of federal control have been announced by the Railroad Administration:

Detroit Terminal	$375,000
Short Lines—	
Northampton & Bath	20,000
Zwolle & Eastern	9,000
Traverse City, Leelanau & Manistique	3,200
Colfax Northern	2,200

The Pittsburgh & Lake Erie paid the director general $250,000.

Dividends Declared

Bangor & Aroostook—Preferred, 1¾ per cent, quarterly, payable July 1 to holders of record June 15.

Chicago, Indianapolis & Louisville—Common 1⅝ per cent, semi-annually; preferred, 2 per cent, semi-annually; both payable July 10 to holders of record June 30.

Cleveland, Cincinnati, Chicago & St. Louis.—Common, 1 per cent; preferred 1¼ per cent, quarterly, payable July 2 to holders of record June 28.

Lehigh Valley—Common, 2½ per cent, quarterly; preferred, 1¾ per cent, quarterly; both payable July 2 to holders of record June 16.

Little Schuylkill Navigation Railroad & Coal Company—$1.25, semi-annually payable July 14 to holders of record June 18.

Mahoning Coal Railroad—Common, $10,00, semi-annually, payable August 1 to holders of record July 16; preferred, $1.25, semi-annually, payable July 2 to holders of record, June 23.

Michigan Central.—10 per cent, payable July 28 to holders of record June 29.

Pere Marquette—5 per cent preferred, 1¼ per cent, quarterly; both payable August 1 to holders of record July 14.

Mohawk Valley—$2.00, quarterly, payable July 2 to holders of record June 22.

New York Central—1¾ per cent, quarterly, payable August 1 to stock of record June 29.

St. Louis, Rocky Mountain & Pacific—Common, 1 per cent, quarterly; preferred, 1¼ per cent, quarterly; both payable June 30 to holders of record June 16.

Trend of Railway Stock and Bond Prices

	June 12	Last Week	Last Year
Average price of 20 representative railway stocks	65.63	64.11	64.18
Average price of 20 representative railway bonds	83.93	83.63	85.62

Annual Report

Colorado & Southern Ry. Co. Twenty-fourth Annual Report

CHICAGO, January 1, 1923.

To the Stockholders of The Colorado and Southern Railway Company:

Herewith is submitted the Twenty-Fourth Annual Report of your Board of Directors for the year ended December 31, 1922, setting forth composite income statement for Colorado and Southern Lines included in this report. Balance sheets, income account and other statements of the several companies comprising the Colorado and Southern Lines are shown separately in the report of the Comptroller.

COLORADO AND SOUTHERN LINES

COMPARATIVE STATEMENT OF INCOME, YEARS ENDED DECEMBER 31

Percent Ry. Oper. Rev.	1922	RAILWAY OPERATING REVENUES	1921	Percent Ry. Oper. Rev.
74.08	$18,019,197.93	Freight	$19,194,785.18	73.04
18.81	4,576,875.62	Passenger	5,481,755.75	20.86
1.65	402,455.56	Mail	342,307.27	1.30
2.07	503,879.78	Express	436,710.34	1.66
1.68	409,913.26	All other transportation	407,421.66	1.55
1.39	338,510.35	Incidental	378,834.22	1.44
.32	77,929.80	Joint facility	39,474.08	.15
100.00	$24,328,762.30	Total railway operating revenues	$26,281,288.50	100.00
		RAILWAY OPERATING EXPENSES		
12.62	$3,069,244.31	Maintenance of way and structures	$3,500,094.79	13.32
21.95	5,340,286.02	Maintenance of equipment	5,216,403.22	19.85
1.21	294,149.45	Traffic	283,360.58	1.08
35.83	8,717,020.40	Transportation	8,918,558.10	33.93
.84	203,331.55	Miscellaneous operations	192,905.54	.73
3.93	956,704.84	General	1,049,378.18	3.99
Cr. 10	23,876.64	Transportation for investment—Cr.	26,617.40	Cr.10
76.28	$18,556,859.93	Total railway operating expenses	$19,134,083.01	72.80
23.72	$5,771,902.37	Net revenue from railway operations	$7,147,205.49	27.20
.....	$1,337,228.53	Railway tax accruals	$1,214,118.96	.....
.....	5,277.34	Uncollectible railway revenue	10,732.17	.....
.....	$4,429,396.50	Railway operating income	$5,922,354.36	.....
		NON-OPERATING INCOME		
.....	$291,674.99	Hire of equipment	$413,488.05	.....
.....	49,840.92	Joint facility rent income	59,904.30	.....
.....	83,175.02	Miscellaneous rent income	71,720.87	.....
.....	655,445.00	Dividends and miscellaneous interest	702,392.93	.....
.....	905.51	Miscellaneous income	62,729.97†	.....
.....	$1,081,041.44	Total non-operating income	$1,310,236.11	.....
.....	$5,510,437.94	Gross income	$7,232,490.47	.....
		DEDUCTIONS FROM GROSS INCOME		
.....	$930,617.76	Hire of equipment	$513,915.35	.....
.....	99,810.63	Joint facility rents	106,519.74	.....
.....	21,257.04	Miscellaneous rents	20,653.12	.....
.....	2,633,647.10	Interest on funded debt	2,661,669.83	.....
.....	3,922.89	Interest on unfunded debt	12,269.49	.....
.....	30,558.86	Amortization of discount on funded debt	17,024.55	.....
.....	53,347.21	Miscellaneous income charges	96,607.66†	.....
.....	$3,773,161.49	Total deductions from gross income	$3,428,659.74	.....
.....	$3,740,484.02	Net railway operating income*	$5,775,311.71	.....
.....	$1,737,276.45	Net income	$3,803,930.73	.....
		DISPOSITION OF NET INCOME		
.....	$680,552.44	Dividends	$680,573.44	.....
.....	$680,552.44	Total appropriations of income	$680,573.44	.....
.....	$1,056,724.01	Income balance transferred to profit and loss	$3,123,357.29	.....

*Includes Railway operating income and Hire of equipment and Joint facility rents.

†Includes "Lap over" items credited and charged by Federal Administration.

GENERAL:

There was a considerable decrease in gross and net earnings of the Companies in 1922, as compared with previous year. Prolonged drought in Texas and New Mexico not only reduced the tonnage of agricultural products, but also limited the purchasing power of the agricultural population and curtailed the inbound movement of merchandise, implements and miscellaneous traffic, and restricted passenger travel on the lines materially.

There was also a marked drop in the price of oil which retarded drilling of wells and development of this industry, which has for several years been an important factor, particularly on the Fort Worth and Denver City Railway. Metal mining in Colorado and operation of the steel plants there, were also on a low schedule throughout the year. Very considerable reductions in rates were made effective during the year by orders of the Interstate and State Commissions. The strike of mechanical department employees on July 1 curtailed operations and increased expenses to a considerable extent.

The net balance of income of the combined lines after appropriation for preferred dividends by The Colorado and Southern Railway Company was, as shown by detailed statement herein, a total of $1,056,724.01. A dividend on the common stock of The Colorado and Southern Railway Company of 3 per cent was therefore appropriated from accumulated surplus, and paid to stockholders as of record December 16, 1922, payable December 30, 1922.

It is expected that the valuation of the properties of these companies by the Interstate Commerce Commission will be practically completed during the coming year. Total amount expended by these companies on this work to December 31, 1922, was $655,357.84.

A pension plan similar to that already in force on many other lines was put into effect April 1, 1922. It has been favorably received by employees and many expressions of loyalty and appreciation received from them. There were on December 31, 1922, twelve employees being paid gratuities and pensions, and the total disbursements during the year for pensions, gratuities and expenses were $4,521.53.

Operating results for the year compared with those of the previous year show the following:

		Operating Revenues	
The C. & S. Ry. Co.	Decrease	$26,983.41	
F. W. & D. C. Ry. Co.	Decrease	1,617,920.70	
The W. V. Ry. Co.	Decrease	307,622.09	
Total	Decrease	$1,952,526.20 or	7.43%
		Operating Expenses	
The C. & S. Ry Co.	Increase	$370,774.71	
F. W. & D. C. Ry. Co.	Decrease	786,315.37	
The W. V. Ry. Co.	Decrease	161,682.42	
Total	Decrease	$577,223.08 or	3.02%
		Net Revenue from Railway Operations	
The C. & S. Ry. Co.	Decrease	$397,758.12	
F. W. & D. C. Ry. Co.	Decrease	831,605.33	
The W. V. Ry. Co.	Decrease	145,939.67	
Total	Decrease	$1,375,303.12 or	19.24%
		Net Railway Operating Income	
The C. & S. Ry. Co.	Decrease	$841,917.04	
F. W. & D. C. Ry. Co.	Decrease	1,019,058.95	
The W. V. Ry. Co.	Decrease	173,851.70	
Total	Decrease	$2,034,827.69 or	35.23%

	Operating Ratios 1922	1921
The C. & S. Ry. Co.	82.55%	79.59%
F. W. & D. C. Ry. Co.	69.22%	66.27%
The W. V. Ry. Co.	66.15%	63.72%
Total	76.28%	72.80%

During the year the following changes have been made in the Long-term debt of these Companies:

THE COLORADO AND SOUTHERN RAILWAY COMPANY

	Retirements	Additions
5½% Equipment Trust Gold Certificates were issued under Equipment Trust of 1922, dated May 1, 1922, between Robert K. Joseph, Jr., Vendor, The First National Bank of the City of New York, Trustee, and The Colorado and Southern Railway Company, covering approximately 75% of the cost of the following equipment, leaving approximately 25% to be paid in cash: 1,000, 50-ton capacity, all steel, 16-door, drop-bottom gondola coal cars, and 200, 30-ton capacity steel underframe refrigerator cars.		
Total par value of above certificates issued..... which mature at the rate of $95,000.00 each year for 15 years to May 1, 1937.		$1,425,000.00
Note No. 2, Equipment Trust Agreement No. 19, U. S. R. R. A.	$70,000.00	

FORT WORTH AND DENVER CITY RAILWAY COMPANY

	Retirements	Additions
5½% Equipment Trust Gold Certificates were issued under Equipment Trust of 1922, dated May 1, 1922, between Robert K. Joseph, Jr., Vendor, The First National Bank of the City of New York, Trustee, and Fort Worth and Denver City Railway Company, covering approximately 75% of the cost of the following equipment, leaving approximately 25% to be paid in cash: 500, 40-ton capacity steel underframe box cars, and 100, 30-ton capacity steel underframe refrigerator cars.		
Total par value of above certificates issued..... which mature at the rate of $50,000.00 each year for 15 years to May 1, 1937.		$750,000.00
Note No. 2, Equipment Trust Agreement No. 20, U. S. R. R. A.	$17,200.00	
Note No. 17, Equipment Trust Agreement No. 20, U. S. R. R. A.	16,700.00	
Deferred rentals under Equipment Trust Agreement—Series "C"	112,000.00	

By order of the Board of Directors.

HALE HOLDEN, President.

Railway Officers

Executive

F. G. Maxwell has been appointed assistant to the vice-president in charge of traffic of the Wabash, with headquarters at St. Louis, Mo.

H. P. Walden has been appointed assistant to the vice-president and general manager of the Pullman Company, with headquarters at Chicago.

R. N. Begien, whose appointment as operating vice-president of the Chesapeake & Ohio with headquarters at Richmond, Va., was announced in the *Railway Age* of June 2, page 1350, was born on March 15, 1875, at Boston, Mass., and was educated in the engineering department of Harvard University. For three years he served as a member of the Nicaraguan Canal Commission in Central America, following which he went to Ecuador, where he spent a year in railway engineering work. Then he returned to the United States to enter the engineering department of the District of Columbia. Mr. Begien began his career with the Baltimore & Ohio on August 1, 1902, as an assistant engineer at Somerset, Pa., and in June, 1908, he became division engineer at Philadelphia. He was promoted to assistant to chief engineer of the Baltimore & Ohio under A. W. Thompson on May 1, 1910, and when Mr. Thompson became general manager Mr. Begien continued as his assistant, becoming assistant to the third vice-president on May 1, 1912. In December of the same year he was promoted to assistant general superintendent, with headquarters at Baltimore, and in July, 1913, was appointed general superintendent of the Baltimore & Ohio Southwestern. In July, 1916, he was appointed chief engineer of the Baltimore & Ohio system, with headquarters at Baltimore. On April 1, the following year, he was appointed general manager of the Eastern lines, and in July, 1918, he became assistant to federal manager (operating) of the Baltimore & Ohio Eastern lines and New York Terminals, the Western Maryland, the Cumberland Valley, the Cumberland & Pennsylvania and the Coal & Coke, with headquarters at Baltimore. In January, 1919, Mr. Begien was appointed federal manager of the Baltimore & Ohio Western lines, with headquarters at Cincinnati, Ohio, and at the termination of federal control he was appointed general manager of the same lines, with headquarters at Cincinnati, the position he held at the time of his recent appointment with the Chesapeake & Ohio.

R. N. Begien

A. F. Platter has been elected vice-president of the Kansas, Oklahoma & Gulf Railway of Texas, with headquarters at Denison, Tex., succeeding G. L. Blackford, deceased.

Financial, Legal and Accounting

G. O. Brophy, superintendent of the Kansas division of the Union Pacific, with headquarters at Kansas City, Mo., has been promoted to assistant to the general solicitor, with headquarters at Omaha, Neb.

W. A. Ragel, assistant secretary and assistant auditor of the Chicago & Eastern Illinois, with headquarters at Chicago, has been appointed assistant comptroller with the same headquarters. **R. L. Williams** has been appointed assistant secretary, with headquarters at Chicago.

F. R. Austin, secretary and auditor of the Chicago & Eastern Illinois, with headquarters at Chicago, has been elected comptroller, with the same headquarters. Mr. Austin was born in Evansville, Ind. He entered railway service in August, 1890, on the Evansville & Terre Haute. He was appointed auditor of this company in March, 1906, and served in this capacity until July, 1911, when he was appointed assistant auditor of the Chicago & Eastern Illinois. In August, 1918, Mr. Austin was promoted to auditor and in January, 1922, he was elected secretary. He held this position at the time of his recent election as comptroller.

Operating

Charles M. Woodward has been appointed superintendent of the Berkshire division of the Boston & Maine, succeeding John D. Bourne, assigned to other duties. **George H. Kidder** has been appointed superintendent of the Connecticut river division, succeeding Mr. Woodward.

C. W. Van Horn, whose appointment as general superintendent of the Maryland district of the Baltimore & Ohio, with headquarters at Baltimore, Md., was announced in the *Railway Age* of June 2, page 1350, was born on January 17, 1879 at Clarksburg, W. Va., and was educated in the public schools and at Salem College. He entered the service of the Baltimore & Ohio as a clerk at Fairmont, W. Va., in June, 1901, and later served as agent successively at Byron, W. Va.; at Flemington and at Clarksburg. In October, 1910, he was promoted to chief clerk to the general superintendent at Baltimore, Md. A few months later he was advanced to trainmaster of the Monongah division, at Grafton, W. Va., and then served in the same capacity at Chicago, and later was terminal trainmaster at Chicago Junction, Ohio. He was promoted to assistant superintendent of the Pittsburgh division on April 1, 1916, and in the early part of 1917 Mr. Van Horn was promoted to division superintendent with headquarters at New Castle, Pa. He later served as division superintendent at Grafton, W. Va., and Cumberland, Md., the position he held at the time of his recent promotion.

C. W. Van Horn

M. M. Sisson, whose promotion to assistant general manager of the St. Louis-San Francisco with headquarters at Springfield, Mo., was reported in the *Railway Age* of June 9, was born on June 23, 1883, at Kahoka, Mo. He entered railway service in December, 1901, as a telegraph operator on the Atchison, Topeka & Santa Fe. A year later he entered the service of the Chicago & North Western as a telegraph operator and in January, 1904, was appointed storekeeper for the Victor Fuel Co., of Denver, Colo. He returned to railway service on January, 1906, as telegraph operator on the Santa Fe and was consecutively promoted to dispatcher and chief dispatcher. In October, 1914, he was promoted to chief dispatcher of the Detroit, Toledo & Ironton and was later promoted to trainmaster and superintendent of car service. He entered the service of the St. Louis-San Francisco on June 1, 1918, as chief dispatcher and in January 1, 1920, was promoted to assistant superintendent. Mr. Sisson was promoted to division superintendent in December, 1920, and held this position until June, 1921, when he was promoted to vice-president and general superintendent of the St. Louis, San

Francisco & Texas, the Ft. Worth & Rio Grande and the Brownwood, North & South railways with headquarters at Ft. Worth, Texas. He was appointed assistant to the president of the St. Louis-San Francisco with headquarters at St. Louis in November, 1922, in which position he was serving at the time of his recent appointment as assistant general manager of the first district with headquarters at Springfield, Mo.

Engineering, Maintenance of Way and Signaling

John D. Isaacs, whose retirement as consulting engineer of the Southern Pacific was announced in the *Railway Age* of June 9, was born on October 6, 1848, at Richmond, Va. He was a graduate of the University of Virginia where he took what was known as the "scientific course." His early practical training was as a machinist's apprentice in Baltimore, Md., and Wilmington, Del. He went west, and on March 1, 1875, entered the service of the Southern Pacific Company as a draftsman in the maintenance of way department. Shortly thereafter he was appointed chief draftsman and later assistant superintendent of bridges and buildings. In 1890 he became acting superintendent of bridges and buildings, and a year later assistant engineer of maintenance of way of the Pacific system. In 1906 he was appointed consulting engineer for the Harriman lines and their subsidiaries and was retained as consulting engineer of the Southern Pacific Company after the unmerger of the Southern Pacific-Union Pacific lines in 1913. It was from this position that he retired recently after 48 years and three months' continuous service. It was in 1878 that Mr. Isaacs completed the device which marks the birth of the motion picture industry. Leland Stanford, who was a close friend of the young engineer and who often sought his advice in mechanical problems, had a dispute with James W. Keene, contending that a trotting horse at one period of its stride had all four feet off the earth at once. Mr. Isaacs devised a simple electro-magnetic release which made it possible to get the series of photographs which settled the matter in Senator Stanford's favor. Railroad devices invented by Mr. Isaacs include a portable wood preserving plant which, with W. G. Curtis, he perfected in 1892; the taper rail, which did away with compromise joints, and the rifled pipe line. The latter was the result of the joint ingenuity of Mr. Isaacs and J. B. Speed.

J. D. Isaacs

Mechanical

Samuel Lynn has been appointed master car builder with headquarters at McKees Rocks, Pa.

Owen J. Brown has been appointed superintendent of fuel service of the Boston & Maine with headquarters at North Station, Boston, Mass.

J. Matheson has been appointed acting master mechanic of the Seattle division of the Northern Pacific with headquarters at Seattle, Wash., succeeding B. P. Johnson who has been assigned to other duties.

O. G. McPhail, formerly master mechanic of the Atlanta, Birmingham & Atlantic at Atlanta, Ga., has been appointed master mechanic of the Cumberland & Manchester, with headquarters at Barbourville, Ky.

G. V. McGlinch has been appointed master mechanic of the Michigan Central, with headquarters at Bay City, Mich., succeeding J. O. Goodwin, deceased. Mr. McGlinch has heretofore served as road foreman of engines.

M. A. Smith has been appointed assistant superintendent of motive power of the Pittsburgh & Lake Erie with headquarters at McKees Rocks, Pa., succeeding D. J. Redding, promoted.

D. J. Redding has been appointed superintendent of motive power of the Pittsburgh & Lake Erie, with headquarters at Pittsburgh, Pa., in charge of the motive power department, succeeding L. H. Turner, assigned to other duties.

S. Zwight, mechanical superintendent of the Northern Pacific lines east of Paradise, Mont., with headquarters at St. Paul, Minn., has been promoted to acting general mechanical superintendent, with the same headquarters, succeeding **H. M. Curry,** who has been granted leave of absence. **T. J. Cutler,** general master mechanic of the lines, from Mandan, N. D., to Paradise, Mont., with headquarters at Livingston, Mont., has been promoted to acting mechanical superintendent of the lines east of Paradise, with headquarters at St. Paul, Minn., succeeding Mr. Zwight. **B. P. Johnson,** master mechanic, with headquarters at Seattle, Wash., has been promoted to acting general master mechanic of the lines from Mandan to Paradise, with headquarters at Livingston, Mont., succeeding Mr. Cutler.

Special

Dr. E. F. Yancey has been appointed medical director of the Missouri-Kansas-Texas, with headquarters at Sedalia, Mo.

W. E. Babb, associate editor of the Rock Island Magazine, has been appointed editor of the new Rock Island Railway Magazine, which has supplanted the former publication.

Obituary

H. E. Sears, assistant general freight agent of the Colorado & Southern, with headquarters at Denver, Colo., died in that city on June 5.

W. C. Armstrong, chief engineer of the St. Paul Union Depot Company with headquarters at St. Paul, Minn., died in that city on June 12.

Sidney Chapman Neale, counsel at Washington, D. C., for the Pennsylvania, the International Mercantile Marine Company, and other large companies for the past 40 years, died at his residence in Washington on June 12.

Joseph O. Goodwin, master mechanic of the Michigan Central, with headquarters at Bay City, Mich., died recently at his home. Mr. Goodwin was born in 1871 and entered the service of the company in 1887 as a locomotive fireman. Subsequently he was promoted to engineman and in 1914 was appointed road foreman of engines, receiving his appointment as master mechanic in 1919.

A. L. Craig, general passenger agent of the Union Pacific, whose death in Omaha, Neb., on June 5, was reported in the *Railway Age* of June 9, was born on November 19, 1861, at St. Paul, Minn. He entered railway service in 1880 as a rodman on construction on the Northern Pacific. He was appointed clerk in the auditor's office in July, 1881, and held this position until April, 1888, when he was promoted to chief rate clerk in the general passenger and ticket office. He was promoted to assistant general ticket agent on September 1 1891, and on June 18, 1900, was promoted to assistant general passenger and ticket agent. Mr. Craig was appointed general passenger agent of the Oregon-Washington Railroad & Navigation Company in February, 1901, and in July, 1906, was appointed passenger traffic manager for the Great Northern. He was appointed general passenger agent in June, 1907, but entered the service of the Chicago Great Western on September 1, 1909, as general passenger agent. Mr. Craig was appointed general passenger agent for the Union Pacific on November 1, 1918.